

UTURE OF THE PC POLL WIN GAMING HEADPHONES!

apc

March
2013

AUSTRALIAN

PERSONAL COMPUTER

**STEAM
COMES TO
LINUX**
PC GAMING'S
NEW HOME?

GET CRAZY FAST HOME WI-FI

**UPGRADE
YOUR NETWORK
SUPERGUIDE**

**DOUBLE YOUR FILE
TRANSFER SPEEDS WITH
NEW 802.11AC ROUTERS
+ ADVANCED SETUP GUIDE**

32-PAGE SPECIAL

**CREATE A KILLER
GAMING PC TO LAST**

- + Best CPUs for gaming revealed
- + Top premium & budget graphics cards
- + Build four super gaming rigs

WORKSHOPS

**HOW TO BACK UP
ANDROID DEVICES**

- + Kill stutter in games & videos
- + Mobile-friendly sites with HTML5
- + We finish Rolly the Arduino robot



OUR DISC
MISSING
PLEASE
QUIRE AT
PLACE OF
RCHASE



9 313006 001362



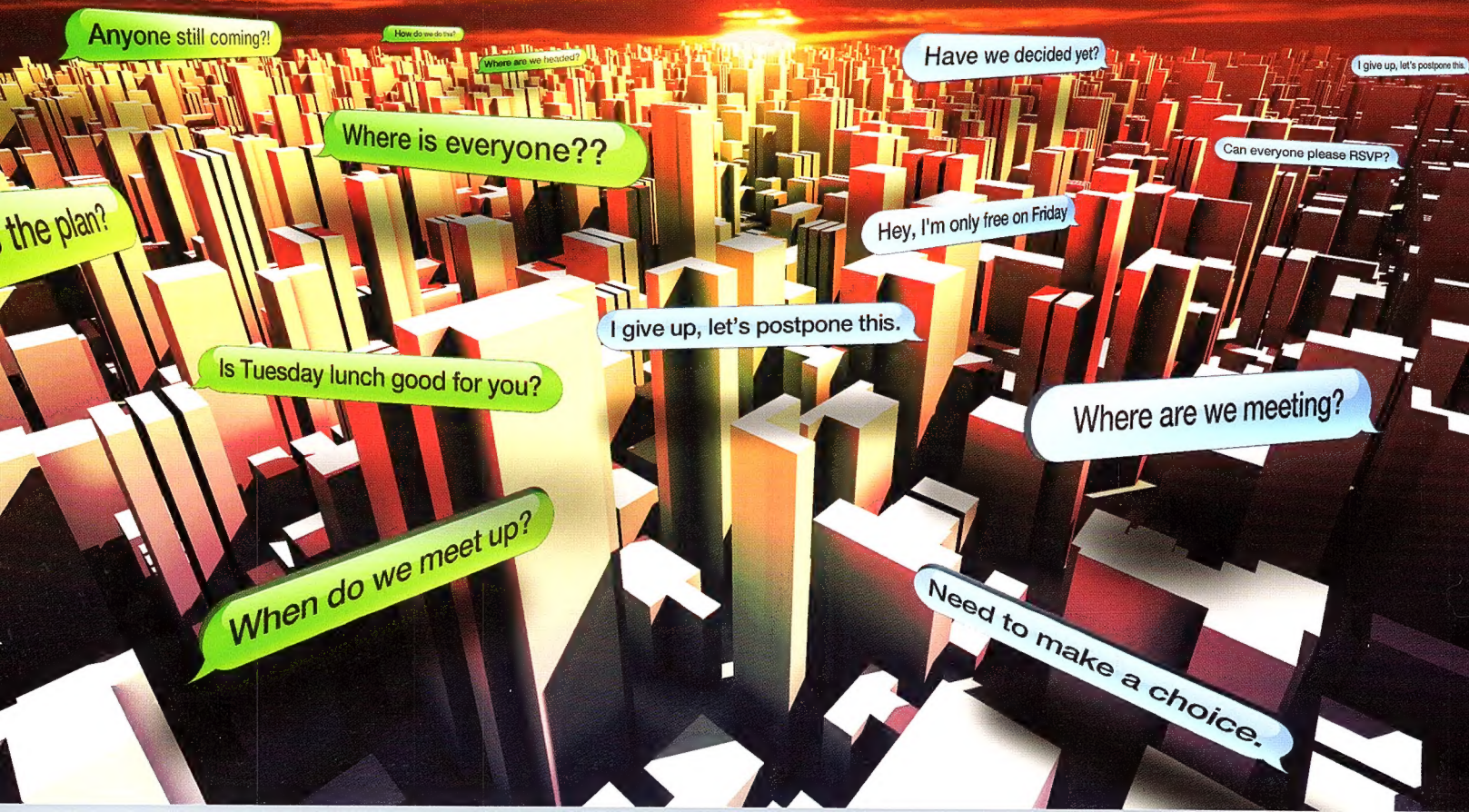
03
\$9.95 inc GST
NZ \$10.30 inc GST



meet*me*.at

Invite. Vote. *Done*.

Available for    and everything else.



03

editorial

TONY SARNO

apc

The 'PC is dying' thing is really starting to grate on me...



Like everyone else, I've jumped on the tablet and smartphone bandwagon. I have an iPad and a Samsung Galaxy Tab 10.1 as well as an iPhone 5, a Samsung Galaxy Note II, a corporate-issue BlackBerry Bold (hopefully I'll have a BlackBerry 10 device by the time you read this) and a Nokia Lumia 920. The point of this is not that I want to come across as a wanker, but that I'm into mobile technology as much as anyone else, and it's fair to say I spend more of my time computing with smartphones and tablets than I do with my PC.

Yet I don't buy into this 'the PC is dying' talk. In fact, it's really starting to grate on me. Yes of course tablet sales and smartphone sales will blow right past PC sales, given that they're personal items that every member of the household is going to buy, unlike a PC. But the cold, hard reality is that the PC does all the heavy-load computing and will continue to do so, and is *not* going away.

No, the PC is not dying, it may change and evolve into different form factors, but the fundamental concept of a desktop device made of configurable, powerful components that can handle the most intensive processing tasks and store humungous amounts of data, will be around forever. Despite all of the mobile devices I carry in my backpack, I simply cannot imagine getting my job done without a PC, and I think that's the story for anybody whose computing requirements aren't limited to just email, web surfing and watching videos.

I think the blame for much of this perception of the PC lies with the PC makers, who've shown a complete lack of creativity over the years, both in evolving and styling the devices and in marketing them. An exception was Apple, who gave the Apple Macintosh and MacBooks a cachet that made them cool to own.

On the other hand, the main PC makers – HP, Dell and a bunch of Taiwanese companies – have been happy to simply ship boxes to the point where a desperate Intel was forced to invent the ultrabook category and enforce design guidelines in order to stimulate sales of laptops. As a result, we've ended up with a situation where the most powerful computing device in the home or business is now perceived as a dinosaur and totally uncool.

For this reason we've launched a poll in which we want you – our readers – to suggest reasons why the PC is important to you, and maybe this can inspire PC makers to market the technology properly. Details on page 8.

tsarno@bauer-media.com.au

EDITORIAL

Editor TONY SARNO tsarno@bauer-media.com.au
 Technical Editor DAN GARDINER dmgardiner@bauer-media.com.au
 Technical Writer DOMINIK KRUPINKSI dkrupinksi@bauer-media.com.au
 Contributors JOHN ALLSOP, SIMON CHESTER, TROY COLEMAN, DAVE JAMES, ALEX KIDMAN, EVAN LAHTI, JEREMY LAIRD, GORDON MAH UNG, ASHTON MILLS, NEIL MOHR, JOSH NOREM, NATHAN TAYLOR, JIMMY THANG, DARREN YATES
 Editorial & Marketing Coordinator HELEN CHEN hchen@acpmagazines.com.au

DESIGN

Art Director DAVID COLLINS
 Senior Designer SALLY RYAN
 Photography GETTY IMAGES

PRODUCTION

Production Editor MELANIE PIKE mjpike@bauer-media.com.au
 Chief Sub-Editor OLGA JEVDIC ojevdic@acpmagazines.com.au
 Sub-Editor GOLDIE HONG, SABINA COLLINS
 Production Controller FIONA OLSSON

MULTIMEDIA

DVD Editor TONY SARNO

ADVERTISING

National Sales Manager FLEUR PORTER
fporter@acpmagazines.com.au (02) 9288 9147
 National Advertising Manager KRISTAL RYAN
krystal@acpmagazines.com.au (02) 8116 9356
 Advertising co-ordinator JEMMA NICHOLSON
JNicholson@acpmagazines.com.au (02) 9288 9149

MARKETING

Marketing Brand Manager TIM MEDWAY

CONTACTING US

Email contact@apctest.com
 Web www.apcmag.com
 Phone (02) 9288 9105 Fax (02) 9267 4909
 Postal PO Box 4088, Sydney NSW 2001
 Street Level 18, 66 Goulburn Street, Sydney 2000
 For opinions you must include your full name, address and B/H contact telephone number, otherwise it cannot be considered for publication.
opinions@apctest.com

REPRINTS AND COPYRIGHT

Contact HELEN CHEN hchen@bauer-media.com.au

SYNDICATION ENQUIRIES

London JOHN SLATER Phone 44 20 7812 6527 Email jslater@acpuk.com
 Sydney GREG ALLEN-WATERS Phone 612 9282 8808 Email gallen-waters@bauer-media.com.au

FOR ALL SUBSCRIPTIONS SALES AND INQUIRIES

Visit: www.magshop.com.au
 Email: magshop@magshop.com.au
 Ph: 13 61 16 between 8am to 6pm (EST) Monday-Friday
 Mail: Magshop, GPO Box 5252 Sydney NSW 2000. One year's subscription is just \$79.95. For full details see page 24. APC magazine is published by ACP Magazines – a division of Nine Entertainment Company

ACP

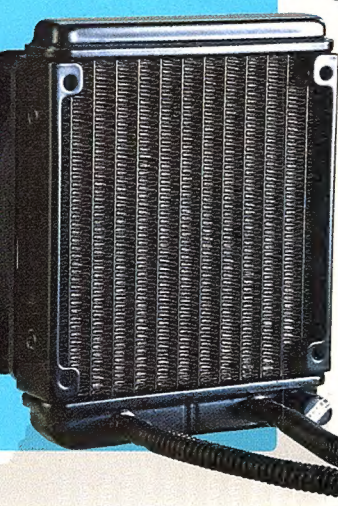
Chief Executive Officer ACP Magazines MATT STANTON
 Publishing Director ACP Magazines GERRY REYNOLDS
 National Sales Operations Manager LEIGH MONTI
 National Group Sales Manager BRIGITTE GUERIN
 Head of Agency Sales JO CLASBY
 Publisher, Men's & Specialist BRENDON HILL

PRODUCT SUBMISSIONS

APC wants to hear about product releases and announcements. However, APC is under no obligation to review or return unsolicited products. APC is published by ACP Tech, a division of ACP Magazines Ltd (ACN 053 273 546), part of the Bauer Media Group. Printed by Webstar. Material contained within APC is protected under the Commonwealth Copyright Act 1968. No material may be reproduced in part or in whole without the written consent of the copyright holders. Distributed by Network Distribution Company, 54 Park Street, Sydney NSW 2000. Phone: (02) 9282 8777. Articles in this issue translated or reproduced from PC Plus are copyright or licensed by Future Publishing Limited, a Future plc group company, UK 2007. All rights reserved. For more information about magazines published by the Future plc group, contact www.futureplc.com. ISSN - 0728-4415



pick the perfect panel



UP FRONT

03 EDITORIAL

TECHNOTES

06 NEWS

The latest developments in the tech world.

10 GADGETS

Hot tech gear we want to own.

12 FEATURE: PICK THE PERFECT PANEL

What to look for when buying a new screen.

14 EPINIONS

See what our readers have to say.

15 END USER

Not everyone is computer literate.

THE LAB

18 LATEST REVIEWS

See what we've put through its paces this month in the APC Labs.

24 GO-ANYWHERE HEADSETS

We test seven to match your gaming laptop.

28 CORE GAMING GEAR

We test a gamut of CPUs and graphics cards so you can build the ultimate gaming rig.

60 GET CRAZY FAST HOME WI-FI

Everything you need to know before you upgrade.

68 MASTER BUILDER: GAMING PC

Here are four new builds, no matter what your budget.

72 SOFTWARE REVIEWS

The best apps across all the stores.

28 core gaming gear



THE LATEST HOW-TOs NEWS AND REVIEWS
www.apcmag.com



get crazy
fast home
wi-fi

HOW TO

- 78 QUICK TIPS**
We fix readers' computing problems.
- 80 WINDOWS**
Tame your system's timer.
- 82 OS CHALLENGE**
Steam for Linux has arrived.
- 86 ANDROID**
Automate your backups.
- 88 MASTERCLASS: ARDUINO**
We continue to build Rolly the robot from scratch, plus how to use him to capture mobile video.
- 92 MASTERCLASS: HTML5**
Adapt your web designs for use on different devices.

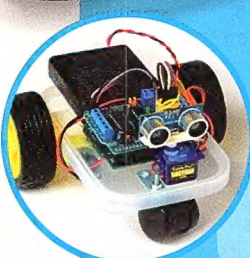
DOWNTIME

- 98 GAMES FEATURE**
Three new zombie games and more zombie madness.
- 105 GAMES**
High-performance playtime.
- 108 CHIP CHAT**
News from the world of geekdom.



PRIVACY NOTICE

This issue of APC published by ACP Magazines Pty Ltd (ACP) may contain offers, competitions or surveys which require you to provide information about yourself if you choose to enter or take part in them (Reader Offer). If you provide information about yourself to ACP, ACP will use this information to provide you with the products or services you have requested, and may supply your information to the contractors who help ACP to do this. ACP will also use your information to inform you of other ACP publications, products, services and events. ACP may also give your information to organisations that are providing special prizes or offers and that are clearly associated with the Reader Offer. Unless you tell us not to, we may give your information to other organisations that may use it to inform you about other products, services or events, or to give to other organisations, that may use it for this purpose. If you would like to gain access to the information ACP holds about you, please contact ACP's Privacy Officer at ACP Magazines Pty Ltd, 54-58 Park Street, Sydney NSW 2001.



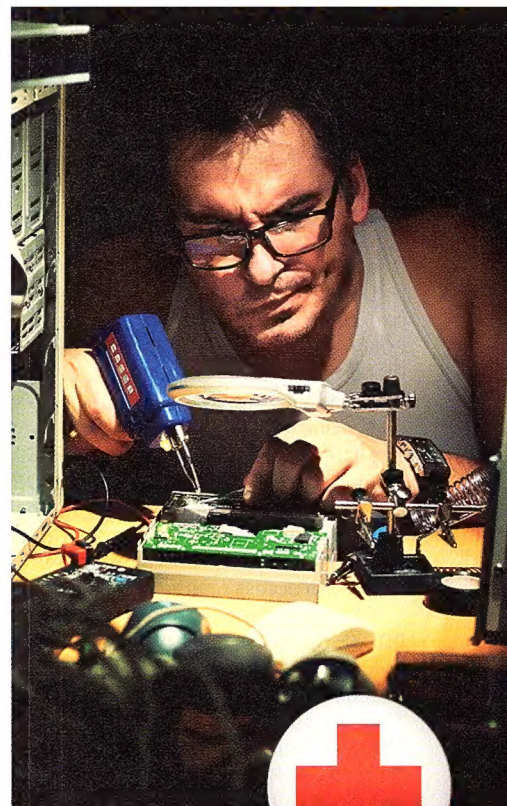
arduino
masterclass

games



BONUS SOFTWARE
FOR APC READERS

on the dvd



RECOVER EVERYTHING

Ultimate software toolkit
for recovering everything
from crashed drives and
deleted files to licence
keys and passwords.

FIRST IN A NEW
SERIES OF MUST-
HAVE TOOLKITS

CES

CES IN A NUTSHELL

We sorted through the tsunami of gear and gadgets released at this year's Consumer Electronics Show in Las Vegas for the most important new developments. **Neil Mohr** reports.

CRUCIAL DDR4

One of the more significant developments for PC technology in 2013 will be DDR4. New memory technologies never set the world on fire in terms of exciting details; it's always a case of 5% increase in speed here and 20% less power there. But they'll eventually work their way into your PC because Intel will make them, so here's what to expect from your memory.

Crucial at CES 2013 unveiled its first working DDR4 DRAM. Based on Micron's 30nm process, the 4GB DRAM is the first product from the memory specialist. The new Crucial DDR4 DRAM modules use up to 20% lower voltage than previous memory, running at 1.2V compared to the standard 1.65V to 1.35V of DDR3. Future versions will even drop as low as 1V. This will enable increased runtimes for mobile devices along with access to greater amounts of memory at lower power.

For the desktop there's the promise of data rates twice as fast as DDR3 – although, more precisely, this means twice as fast as the original DDR3 (but we're talking 2.4 billion transfers a second). That's enough to outpace the 2.1 billion of the speediest PC3-2133 memory. The big issue with a planned release – slated for the end of 2013 – is what you'll plug DDR4 into. Intel will offer DDR4 memory support in its server Xeon Haswell-EX processor released in 2014, but mainstream support won't appear until 2015 with the introduction of Skywell...

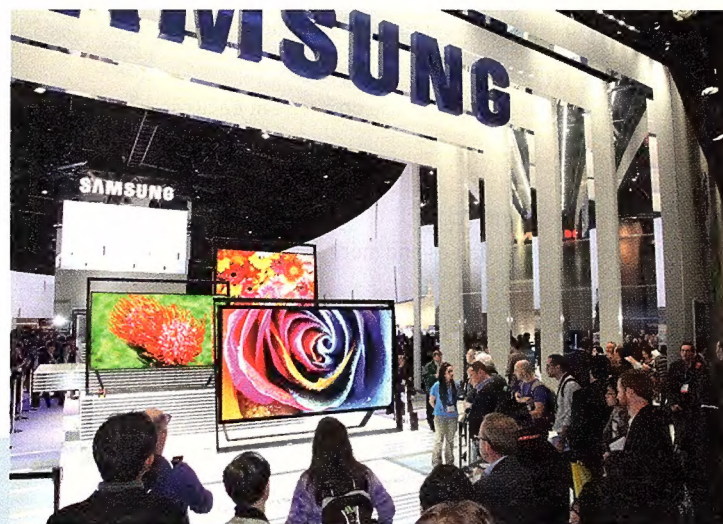
STEAM PISTON

Confusion reigned for a while with the dual appearance of Valve and a Steam Box sound-alike called Piston Box from Xi3.

First tackling Valve, it was there but wasn't demonstrating anything to the public. Rather, it had a private booth where it was talking with strategic partners about its up and coming Steam Box gaming system,

which is code for making deals. Gabe Newell did go on record to say they had talked with around 20 companies about building optimised Steam Box devices, which is really a PC-platform to run Steam and other network applications.

Much of what was said was looking to the future, but the start will be a living-room PC box that can drive Steam Big Picture and anything else you fancy. It sounds like Newell wants this to be multi-screen across the home. So as you move from room to room you take your gaming with you. Initially this will rely on existing network technology, but ultimately the vision requires next-generation post-Kepler GPUs that can virtualise rendering, so a Steam Box 'gaming server' could drive 3D rendering on multiple screens around the home for many people wishing to play. He also outlined that the initial platform would be a home system/server



DISPLAYS GO ULTRA HD

WHY YOUR NEXT MONITOR WILL BE 4K

If you didn't have a 4K UHD TV on display at CES 2013, you were nobody. That's why everyone did. Sony was really pushing 4K with the Sony X9000A 65in 3,840 x 2,160 set that will be available mid-year. That resolution is exactly double 1,920 x 1,080 or eight million pixels. It matches the top resolution used in digital cinemas and scanned 35mm film stock. (Note that most digital films are shot on 2K cameras.)

Not to be outdone by Sony, the likes of LG, Samsung, Panasonic, Toshiba and Sharp all had

their own UHD 4K sets on display. Samsung took the size prize with its 85in monster and plans for a 110in, ahem, ultra-monster.

An issue none of the manufacturers seemed to really tackle was the lack of content. Sony has been supplying a \$5,000 UHD media centre full of 4K films to owners of its current 84in behemoth and announced a digital distribution system for true 4K content. It also announced a series of Blu-ray discs 'mastered in 4K', but actually still 1080p, so utterly useless.

While these initial sets will cost in the tens of thousands of dollars region, the price will plummet with affordable 4K displays coming through by around 2017 and finally give us a step-up from the existing maximum 2,560 x 1,600 resolution on 30in PC displays. As for connections, currently DisplayPort supports 4K resolutions at 60fps, HDMI 2.0 will support 4K at 60fps as HDMI 1.4 can only achieve 24fps and dual-link DVI can achieve 4K resolutions, but only at 33fps. So most new cards can support them, too.

The 2013 Consumer Electronics Show unveiled upcoming must-have gear and gadgets.



Xi3's Piston Box game console.

Nvidia's Project Shield is a Tegra 4-powered handheld console.

codenamed 'Bigfoot' with a mobile proposition for tablets and smartphones called 'Littlefoot', but that's further down the line.

Going back to the Piston from Xi3, it was developed with funding from Valve. This was dubbed at CES 2013 as the first Steam Box but it actually isn't just yet. What it is, though, is a sub-micro \$999 gaming PC based on a quad-core AMD APU, a three-part modular motherboard and in total consumes less than 40W. We understand a final unit will use the same iconic chassis, but the internals could all change. Confusing but tantalising.

NVIDIA SHIELD

We all expected the Nvidia Tegra 4 to be announced at CES 2013, but no-one expected Nvidia to announce something like Project Shield, which turned out to be a Tegra 4-powered handheld console. Based around a 5in 720p HD screen and Xbox-styled controller, Project Shield is shaping up to be an impressive-looking portable Android 4.1 console.

Nvidia is hoping to widen its attraction by throwing in a number of impressive and useful home PC features. For one it can double as a general device controller – Nvidia showed it controlling a new LG 4K Smart TV. Beyond this, it can also stream games direct from your PC, so you can play them on the Project Shield screen. This included the PC game service Steam running in its Big Picture mode and could make it very attractive to PC fans. Project Shield is said to be in Beta at the moment so it could be on sale by summer 2013 with pricing touted to be around the \$600 mark.

OCULUS RIFT

Is this the device that will finally make virtual reality a



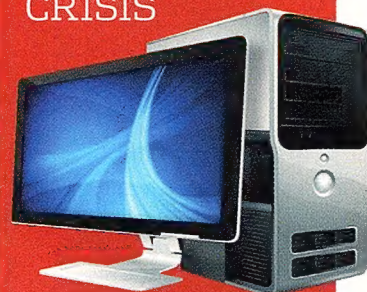
Oculus Rift, a virtual reality gaming headset.

physical reality? The \$2.4 million backing this on Kickstarter says yes, and CES 2013 had the latest iteration on show and available for testing. Best described as a large set of ski goggles, inside the headset are two 640 x 800 displays with focusing lenses, which provide a final 1,280 x 800 HD image.

With built-in motion sensors and standard video input, any game built to work with the kit will offer a motion-aware experience. So as you turn your head, so does the display. The demo was powered by a mere Xbox 360 running the *Epic Citadel* demo and worked smoothly enough. But we can't help but feel it's not much more than a gimmick, similar to 3D glasses, and we're not sure we'd want to swap our large 1080p displays for downscale 720p. There are still questions on just how you aim while looking in the wrong direction, too...

TOP 10

THE FORM FACTOR HAS AN IDENTITY CRISIS



01 PERSONAL COMPUTER

A powerful desktop box with configurable components.

02 ALL-IN-ONE/IMAC

The PC turned into a single screen appliance.

03 LAPTOP

A PC squeezed into a portable chassis.

04 ULTRABOOK

A really slim laptop with longer battery life.

05 NETBOOK

A low-power laptop that was a fad for a while.

06 TABLET

A super light and slim content consumption device.

07 LAPLET

A laptop with swing screen that turns it into a tablet (perfect for Win 8)

08 TABTOP

A tablet to which you can attach a keyboard, turning it into a laptop

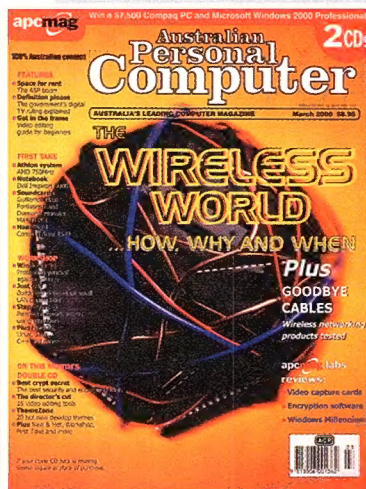
09 PHABLET

Super-sized phone, with a display between 5 and 7 inches.

10 FONEBLET

Like a phablet. Think Samsung Galaxy Note.

THE (A)PC REVOLUTION MARCH, 2000



CASHBOOK

When is a CEO not a CEO? When he's one of the two most famous CEOs in the computing scene. Steve Jobs has dropped the long-standing 'interim' title from the top job at Apple. He now goes by new title iCEO, which stands for 'internet CEO'. Jobs, who is paid a salary of US\$1 per year for the job, has nonetheless received some impressive rewards. Apple continued its recent record of strong performance, posting a net profit of US\$183 million driven by sales of 700,000 iMacs and 235,000 iBooks. Apple's board voted to give Jobs a Gulfstream V jet in recognition of his services.

CAN TELSTRA BUY OZEMAIL?

Telstra's plans to acquire the consumer business of rival ISP OzEmail and form a \$300 million internet access powerhouse appear all but dead after the Australian Competition and Consumer Commission (ACCC) ruled that such a merger might permanently stifle competition in the rapidly changing internet market.

APC POLL

Future of the PC

The PC has been getting some bad press lately as mobile technology's spruikers and the tech blogosphere swoon over smartphones and tablets. Enough! We're going to make the PC cool again. Tony Sarno

The PC (or laptop) is the only way you can do serious computing. Period. That might include complex spreadsheets, serious video editing, hardcore gaming, rendering of 3D designs, working on lots of documents at once easily, and so on. The list is basically endless. And yet you'd think the PC was on its deathbed.

The perception isn't helped by companies such as Intel announcing that it's focusing its chipmaking efforts on mobile technology, and even getting into TVs. And then of course there's Microsoft, the original champion of the PC, deciding to modify Windows for tablets and touch-enabled devices. While we believe that tablets and smartphones are now an essential aspect of personal computing, they're part of a Trinity of essential technologies, of which the PC is a part.

There's definitely scope for the desktop PC to evolve and change form factor, but the fundamentals of the PC – those of a flexible, configurable set of powerful components that can be mixed and matched depending on the application – will never be matched by the appliance-like smartphones and tablets, no matter how powerful or artificially intelligent those devices become.

In other words, the PC/laptop will be around forever, but we think its makers need to work a bit harder at championing it. In reality, a PC is a cool powerhouse of content creation and processing power on which the great advances of science, business and industry are founded.

So here at APC, we've decided to give the PC makers some ideas to market the PC and make it cool once again, by asking you to tell them why the PC is – and always will be – essential. Don't get us wrong – we're as addicted as anyone to mobile devices – but we think the PC is the bedrock of all serious computing. So here's the deal:

The poll

To help PC makers market the PC, tell us in our Future of the PC poll, why your PC, Linux or Mac desktop is essential to you, focusing on the roles that tablets and smartphones can never replace. Take the poll at apcmag.com/futureofpc. The best suggestions will win prizes, which will be listed on the web site. They'll include cool gear like this Corsair Vengeance 2000 Wireless 7.1 Gaming Headset. The Vengeance 2000 gives you realistic multichannel gaming audio and play-for-hours comfort. Renowned Corsair sound quality makes it the wireless headset for gamers who care about audio. RRP \$185.90.



Twice the virtualisation. Lower management costs. None of the compromises.

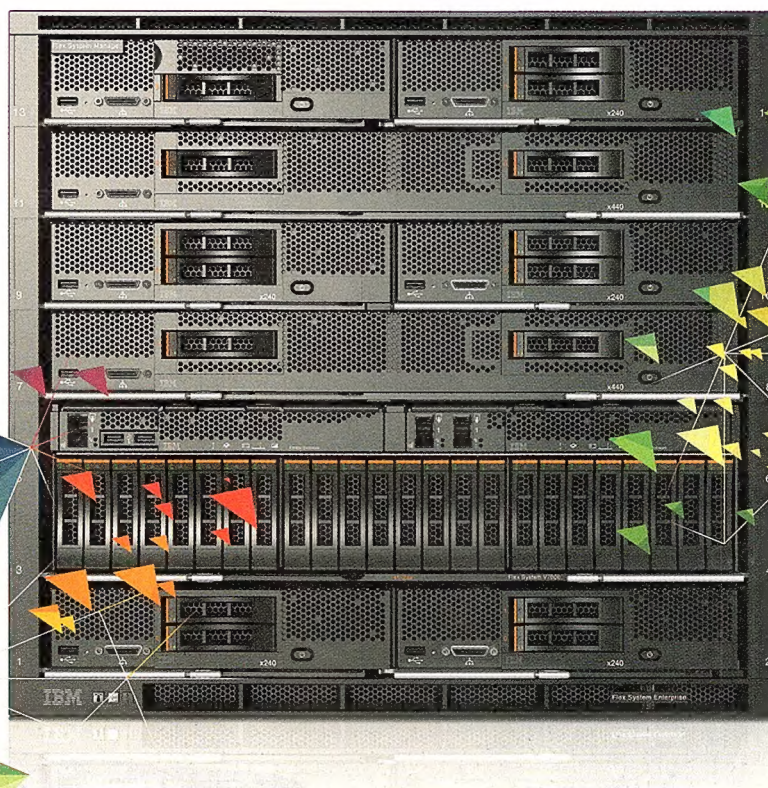


You've been looking for IT solutions that meet the increasingly sophisticated demands on your infrastructure. IBM® Flex System™, featuring Intel® Xeon® processors, provides simplicity, flexibility and control in a system that doesn't require compromise.

It supports up to twice the number of virtual machines as the previous generation of blade servers.¹ And IBM Flex System Manager™ can help reduce management costs by providing visibility and control of all physical and virtual assets from a single vantage point.²

You can select individual elements and integrate them yourself or with the support of an IBM Business Partner. Or you can choose an IBM PureFlex™ System and leverage IBM's expert integration for an even simpler experience. Learn more at ibm.com/au/no_compromise

Learn why Clabby Analytics says IBM Flex System is the best blade offering in the market. Download the paper at ibm.com/au/no_compromise



¹ Based on IBM testing and documented in IBM System x® Virtualisation Server Consolidation sizing methodology. IBM Flex System x240 supports 2.7X more Peak Utilisation Virtual Machines (VMs) than previous generation BladeCenter® HS22V.

² Based on IDC white paper "The Economics of Virtualisation: Moving Toward an Application-Based Cost Model," Michelle Bailey, November 2009, <http://www.vmware.com/files/pdf/Virtualization-application-based-cost-model-WP-EN.pdf>

IBM, the IBM logo, System x, BladeCenter, PureFlex, IBM Flex System Manager and IBM Flex System are trademarks or registered trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. For a current list of IBM trademarks, see www.ibm.com/legal/copytrade.shtml. Intel, the Intel logo, Xeon, and Xeon Inside are trademarks or registered trademarks of Intel Corporation in the U.S. and/or other countries. ©International Business Machines Corporation 2013. © Copyright IBM Australia Limited 2013. ABN 79 000 024 733. All rights reserved. IBMCCA1466/PureFlex/APC/FPC

10 gadgets

Sony MN2

Sony's Android-powered SmartWatch might not be quite as cool as Inspector Gadget's equivalent, but it's still pretty neat in our book. The device connects to your Android smartphone via Bluetooth and lets you install widget-like apps, letting you get Twitter updates, weather and more at the flick of your wrist. There's even a spy cam app that lets you surreptitiously obtain video from your smartphone camera. Use it only for good, kids...

ONLINE: tinyurl.com/aeb6e6e

\$129



\$3,099



Algiz XRW

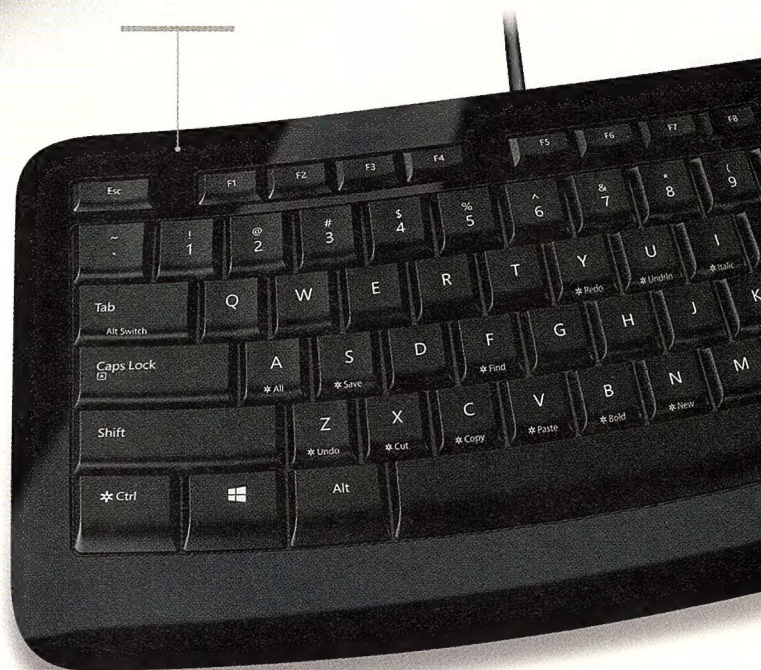
You want an extra rugged version of an ultrabook? One you can drop 1.2m and have it survive unscratched? Swedish maker Handheld Group has released a new and even tougher version of its Algiz XRW locally, which is pretty slim and lightweight (1.5kg) with a 10.1in touchscreen display that's visible in the brightest daylight. Inside is an Atom chip, 4GB of RAM and a 128GB drive, which may not seem that powerful, but the company assures us it has half-decent battery life of 8 hours. The notebook acs toughness standards and comes with IP65 rating for protection against sand, dust and water, and passes the MIL-STD-810G ruggedness testing, meaning it can not only survive drops from chest height, but can also handle extreme temperatures from -20°C to 55°C.

ONLINE: www.handheld.se

Microsoft Sculpt Comfort Keyboard

Microsoft already sells a mobile keyboard from the Sculpt range in Australia, so this is the next one in the line, for desktops. These are keyboards specially designed to reduce stress on your hands when typing to reduce risk of RSI. The new Sculpt Comfort Keyboard continues Microsoft's legacy of creating ergonomic peripherals; the curved design keeps keys close to your fingers while typing, and the padded wrist support makes it comfortable to use. It coincides with the release of Windows 8, so along with a redesigned logo on the Windows key, some function keys double up as shortcuts. This keyboard should make typing a pleasure.

ONLINE: www.microsoft.com.au



Logitech T400

The Logitech T400 Zone Touch Mouse is another entry in Logitech's range of peripherals designed to make the switch to Windows 8 more palatable for those of us without touch-enabled devices. Rather than the whole face of the mouse being touch-responsive, only a small part of the mouse responds to gestures. This helps prevent some of the problems we've experienced with the M600, where the mouse scrolls or flips through documents when we accidentally brush a hand over the top surface. The touch-sensitive part of the T400 is confined to the middle button, and it's responsive, letting you scroll both horizontally and vertically. Clicking the middle button brings up Windows 8's Start screen, which is a nice touch. It won't win any design awards, but it's an improvement on previous mice.

ONLINE: tinyurl.com/aeoxvws



\$65



\$90

Logitech T650

It's no secret that Windows 8 is geared towards touchscreen devices – so you'll be missing out on a few of the features if you don't have a touch-enabled PC. Logitech's T650 Wireless Rechargeable Touchpad is a solution to this, as it allows you to perform Win 8 gestures no matter what your hardware is. Connecting it up to a PC is simple, and it comes with a Logitech Unifying USB dongle, which lets you connect up to six compatible Logitech devices to a single dongle. The glass top makes scrolling through the Start screen nice and smooth, and the touchpad is pretty fast and responsive. Unfortunately, tapping to select an app or file wasn't always accurate, but this is still a fine peripheral to connect to your PC if you're having trouble adjusting to Windows 8.

ONLINE: tinyurl.com/b5hqn6j

\$240



\$TBA



Buffalo MiniStation Thunderbolt

The MiniStation Thunderbolt from Buffalo is a sturdy and portable hard drive that's attractively designed. It comes with a USB 3.0 connection, so even if you're on a computer that doesn't have Thunderbolt, you'll still see the benefit of a faster connection. It only comes with one Thunderbolt port however, but USB 3.0 and Thunderbolt cables are included. What really matters is the speed at which the MiniStation transfers data. In our real-world tests, we sent a 1.36GB file in just 36 seconds. It's impressive, but doesn't blow USB 3.0 out of the water, despite the Thunderbolt drive's potential.

ONLINE: tinyurl.com/aeb6e6e

NEW SERIES: WHAT TO LOOK FOR

PICK THE PERFECT PANEL

What to look for when you're buying a screen.



Are PC monitors merely badge-engineered commodity items? It's certainly true that only a small handful of manufacturers actually make the LCD panels that go into them, which means there are recognisable levels of technological overlap. Take for instance the fact that many of the current crop of affordable IPS screens share panels.

Occasionally a monitor manufacturer picks up a new panel before the competition. For example, Viewsonic seems to have stolen a march by upgrading its IPS 23in from 6-bit-per-channel colour to 8-bit.

What's more, image processing electronics can make a difference, especially when it comes to colour dithering. We use the trusty Lagom LCD suite of test images and metrics to provide a common baseline. Handily, you can too, by popping over to www.lagom.nl. There are test images to help you assess everything from viewing angles to pixel response and colour fidelity.

If that's the more objective part of the equation, there's no substitute for some subjective immersion. That'll be games, movies and just flicking about on the desktop. Sometimes a screen that doesn't perform all that well in the objectives is still a very nice panel in practice.

1 PANEL TYPE

This is the biggie – the heart of your display machine. You've basically got three choices: TN, IPS and VA.

TN is the cheapest and quickest in terms of pixel response. It's also the best for pure gaming. For everyone else, IPS is the affordable option, offering superior viewing angles and colours to TN. Pixel response isn't that far behind either, making it a tough sell for the TN panels. VA is the odd one out. It's used fairly infrequently now, but offers better blacks and contrast than both TN and IPS along with colour fidelity and viewing angles that sit somewhere in between the two other technologies.

2 BACKLIGHT TECHNOLOGY

We've been waiting aeons for a dramatic change in panel technology, and yet it never seems to materialise. In the meantime, at least the backlight technology tree has been given a good shake. In the last



few years, CCFL (cold cathode fluorescent) backlights have been almost entirely replaced by LED backlights. Almost every PC monitor is now LED.

But not all LEDs are made equal. For starters, there's the choice between white and RGB LEDs (or red-green-blue LED) backlights. The latter produce purer, cleaner light and allow a broader colour space. But they're expensive and relatively rarely used.

3 IMAGE PROCESSING

Manufacturers know that big numbers make a big impression when you're in the market for buying a screen – numbers like 10,000 to one or even a million to one when it comes to contrast ratios, for instance. They sound impressive – all the more reason to choose one monitor over another, perhaps, but not the be-all and end-all. Little numbers work, too, like 1ms for pixel response. Many of these and more are made possible by image processing technology.

Big contrast is achieved via backlight modulation, dimming the lights when dark images and video are displayed. Faster pixel response is done courtesy of overdrive algorithms that pump pixels with exaggerated voltages. The thing is, none of them are a substitute for a good panel. Strong contrast with a static backlight is always better than the dynamic sort. And overdriving pixels can lead to nasty side effects, like inverse ghosting.

4 REFRESH RATE

Forget stereoscopic 3D, the next big thing in PC monitors is 120Hz refresh. At least we think it ought to be. As it happens, the faster 120Hz refresh standard (most LCD monitors are 60Hz) only came about because it was necessary for active shutter 3D technology. But never mind that, because it's here now and it's lovely. Until you've seen the added smoothness and felt the increased response, it's hard to really appreciate the benefits of 120Hz. But once you've seen it, you won't want to go back to 60Hz. Unfortunately however, 120Hz technology is currently limited to screens with TN panels. We're still waiting for the ultimate combination of 120Hz and IPS or VA.

5 VIDEO INPUTS

Now that we've all gone digital, surely video inputs don't matter? Up to a point, that's true. Indeed, the video signal used by DVI and HDMI is essentially shared, which is why those little DVI-to-HDMI adaptors are possible. But there are a few extra things worth factoring in. Screens with resolutions beyond 1,920 x 1,200 or with 120Hz refresh speed need dual-link DVI or an HDMI 1.4 port on your graphics card to pump all those pixels. And what about DisplayPort? It offers several theoretical advantages, including the ability to daisy chain multiple monitors in a serial setup. In reality, that's a fairly unlikely usage scenario. As things stand, we'd pay extra for DisplayPort. **BTG**

airFiber™



1.4 Gbps+
real throughput

**Less than
\$2500 each**

UBIQUITI
NETWORKS

FreeNet Antennas

www.freenet-antennas.com/af



WHOA WINDOWS WOES!

I totally agree with David Harrison's comments (*APC* February, page 14) pointing out the unfair anti-Windows 8 bias of *APC*. The inability of *APC* staff to come to terms with the Modern UI Start screen pervades all Windows 8 (and Windows 7) articles. Even Bennett Ring's article on how Windows 8 blows away Windows 7 in just about every field you can think of (*APC* February, page 54) is prefaced with negative comments about Windows 8's Start screen.

Crikey, the loss of a button saying 'Start' seems to have writers on a crusade of bagging the Windows 8 Start screen. I believe that in Windows 7 the 'Start' button was actually harder to use and slower than in Windows XP because you had to resort to a desktop of shortcuts when the 'Start' button did away with a lot of the drop-down, slide-out menus.

What a waste of time scrolling down all those programs in Windows 7. Now, turn on your computer and all the programs you're likely to use (bring up 'All Apps' if you need others) are there. Just choose one and you're in the desktop with the program open. If you want another program you don't have on the Taskbar, hit the Window key and choose another. It's much quicker and more productive for me (and typists) anyway.

I'm over 70, I started with DOS 5.0 and believe this is the best evolution of Windows NT yet and I've had them all.

I do think Microsoft could have handled it better. After all these years producing OSs and having an army of developers and soothsayers, Microsoft still doesn't appreciate that users will no longer blindly follow, like they did 10 years ago. I fear it does this at its peril. If Microsoft just had a single setting: 'Do you want to start in Desktop?', a lot of this backlash could have been avoided and Windows 8 would definitely sell better.

One wonders why Microsoft is so intent on forcing an x86 OS to behave the same as the Android OS. Gee, they had Windows NT and the DOS-based Windows running in parallel for years until they merged in Windows XP.

Wilfred Lynch | Chapman Hill WA



BIGGER APC

Why have you changed the size (width) of your magazine? It's now unusable. I like to split my magazines into different articles and file them under the appropriate topics. This sometimes necessitates photocopying the odd page so I can split the articles properly (where two articles share a leaf). It's now very tricky to do this.

The new size doesn't fit into standard manila folders without sticking out the side. Ring binder dividers are not wider than your pages and so are not easily found in a binder. Your pages won't fit into standard sheet protectors (plastic sleeves for binders). This adds up to my no longer being able to buy your magazine. If there's an article I really 'need' I'll photocopy it (being very careful) at my local library.

Tony McArdle / from the internet

Editor replies: The reason we switched to a bigger size is that it allows us to do more with layout. If you like to archive the magazine, I would suggest you buy the iPad (interactive) or Android (full replica) versions, which you can archive on your tablet.

WINDOWS 8 PC REVIVER

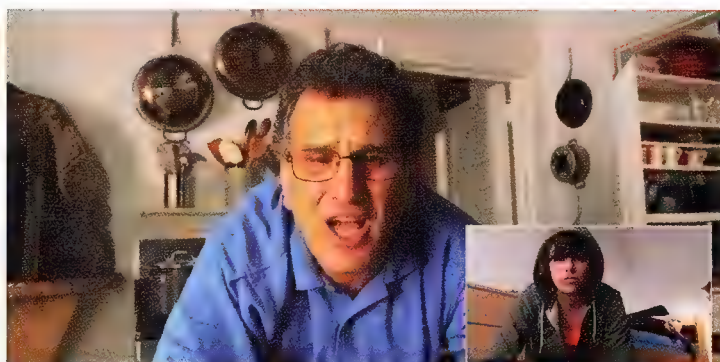
Thanks for pointing out the advantages of Windows 8 over Windows 7 in your February issue. I installed Windows 8 on a three-year-old Core 2 Duo laptop and the difference in performance is unbelievable. To other readers, I would say to put aside the quibbles on the Start menu or lack of, and do yourself a favour – get Windows 8 running on your old hardware. Since it was designed to work across hardware like tablets, it just rocks on older PC hardware.

Mal Williams / from the internet

EPINIONS@APCTEST.COM

Come on, have your say!

We want to hear what you think. Add to these discussions or email your views (in fewer than 250 words) to epinions@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.



DUMB COMMERCIALS

In Australia we're spared most of the TV commercials for computing products screened in America. Just as well, since some border on the ridiculous. Here are some examples...

Truly one of the stupidest TV commercials ever is one screening in the US for Facebook (youtu.be/c7SjvLceXgU). Aside from wondering why Facebook feels compelled to advertise – it has no serious competition – we're flabbergasted that the commercial compares Facebook to a chair. Yes, a chair. Facebook is asking viewers to associate the social network to chairs. The commercial's voice-over says things like, "Anyone can sit down on a chair, and if the chair is large enough they can sit down together... And that's why chairs are like Facebook". OK, we get that everybody uses chairs and so Facebook wants to be as universal as a chair, but seriously, why compare one of the most revolutionary developments in social communications to the dull, inanimate, uninspiring object on which we stick our rumps every day?

Another shocker of a TV commercial that we'll never get to see in Australia, is again by a social networking giant: Google. It advertises a bunch of Google products such as the Chrome browser and Google+. The storyline is a complete tearjerker, to the point of being nausea-inducing: a father and daughter communicating over the internet and organising their daily lives after the death of the mother. So the plot really is, you know, Mum used to organise their lives, but since her unfortunate exit into the next world, Google stepped in and is doing a reasonable job of it, in fact, probably a better one than the dearly departed. See this amazing commercial at youtu.be/w1sT7QV8nfU.

Samsung has generally done a great and seemingly effective job of poking fun at Apple fanboys and fangirls. It ran a memorable set of TV commercials ('The Next Big Thing is Already Here'), showing

queues of fanboys waiting mindlessly for the next iPhone release and getting excited about features that were already in the Samsung Galaxy phones. One of these commercials included a truly great poke at the artistic pretensions of Apple users, when an Apple fanboy said: "I could never get a Samsung, I'm creative," and another fanboy said, "Dude, you're a barista." Brilliant!

Samsung should have stopped there. A recent commercial in the US poked fun at BlackBerry users this time (youtu.be/5fcUf4d-Y3s). The idea behind the commercial was to push the BYOD (Bring your own device) enterprise credentials of Samsung smartphones at the expense of BlackBerries. But then the creative geniuses behind the commercial ruined it with the kind of business they chose as their idea of 'enterprise' – a hypothetical gaming studio developing a game based on magical unicorns. In other words, in trying to win enterprise credibility, they chose a bunch of self-centred Gen Y game developers as the representatives of business. Worse still, the Samsung-using developers treat BlackBerry users as idiots, i.e. the very users Samsung needs to win over to get its Galaxy phones into businesses. Wonder if that commercial will also make much sense once new BlackBerry 10 phones arrive.

Portraying your target audience as stupid is never really a good idea, as Apple found out after a series of commercials during the Olympics, which made fun of users. The ads, for the Genius Bar help and troubleshooting desks in Apple stores, portrayed users as completely inept as they sought help. After much criticism Apple pulled the ads, although it claimed this had nothing to do with the response. www.fox.com

ENDUSER

Share the hilarity!

Do you work in the IT industry and are forced to deal with inept and clueless end users on a daily basis? Do you have an IT professional, who isn't that 'professional'? If you have an interesting or amusing story, email us at contact@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

SUBSCRIBE 12 ISSUES FOR

TEST YOURSELF: THE ANNUAL HOLIDAY GEEK QUIZ

FREE PC AUDITOR APP
Know your PC before you start

February 2013

apc
AUSTRALIAN PERSONAL COMPUTER

MIRACLE PC FIXES

SPEED UP YOUR OLD PC WITH WINDOWS 8

- + Accelerate your GPU
- + Hack programs to make them faster
- + Other clever PC boosting tips

GAMES GAMING LAPTOPS
Comparison reveals trend to thinner and sexier machines

PRIVACY PROTECT YOUR DIGITAL PRIVACY
Prevent the web from stealing your ID

WORKSHOPS BUILD A MICROBOT STEP BY STEP
(ARDUINO CAN BE FUN)
+ Install Windows 8 from scratch
+ Advanced CSS3
+ Fixing a sluggish PC

FREE & LOW-COST UPGRADES THAT WORK!

LOW-COST PC CR...

TINY SUB UPGRADE
Build a centre for less

UNLEASH WINDOWS 8

HARDWARE GUIDE

HYBRIDS, ALL-IN-ONES AND LAPTOPS THAT MAKE WINDOWS 8 YOU

12 ISSUES FOR ONLY \$79.95

Going from simple to sophisticated user interfaces

apc magazines
\$9.95 inc GST
KZ 540 30 inc GST

apc magazines
\$9.95 inc GST
KZ 540 30 inc GST

IF YOUR DISC IS MISSING PLEASE PROVIDE AT PLACE OF PURCHASE

TWO EASY WAYS TO SUBSCRIBE TO APC MAGAZINE

NOW AND GET THE PRICE OF 8!

SO WHY SUBSCRIBE?

- 12 issues of your favourite tech mag for the price of 8!
- Pay only \$6.66 per issue instead of \$9.95 at the shops
- Free delivery of every issue straight to your door
- Free cover-mounted DVD with all the best software on every issue



HURRY! OFFER ENDS
MARCH 12, 2013!

SAVE \$39.45 OFF THE
NEWSSTAND PRICE — JUST
\$79.95 FOR 12 ISSUES

FREE DELIVERY
TO YOUR HOME OR
OFFICE EACH MONTH



VISIT www.magshop.com.au/apc

OR



CALL 13 61 16 and
quote **M1303APC**

OCZ Vector 256GB SSD

OCZ's new flagship SSD kicks serious ass.

SSD

www.ocztechnology.com @

\$300 \$

Fast, impressive performance. ✓

Upper end of the price spectrum. ✗



VECTOR

2.5" solid state drive

ocz technology

INDILINX
INFUSED

Say hello to what most of us would have considered the new OCZ Vertex 5 SSD. That's right; this isn't some offshoot, subpar asynchronous-NAND-using bargain-basement drive, but OCZ's new benchmark-busting flagship SSD, and the first to use the company's very own Indilinx Barefoot 3 controller and firmware rather than a modified Marvell or SandForce controller like OCZ's previous drives. Since the drive uses OCZ's own controller, the company ditched the Vertex branding and went with an all-new name, hence the Vector badge.

OCZ is claiming this drive is all-around fast, and can not only read and write like the dickens but also boasts extremely high IOPS performance and longevity – the latter of which is backed by an impressive five-year warranty. The drive uses 25nm ONFI synchronous MLC NAND flash, feels extremely solid, and even looks pleasing to the eye with its radiused edges.

It's also just 7mm thick, so it should fit into some ultrabooks. It rides the SATA 6Gbps interface, and supports Trim, garbage collection, SMART and ECC error-correcting, and ships with a 3.5in bay adapter as well as a copy of Acronis drive-cloning software. Of course, all of these features and endurance don't come cheap, and the Vector is priced right at the tippy-top of the price range for 256GB SSDs, hovering a little above the Samsung 840 Pro.

In our tests, the Vector's performance was extremely impressive, running neck-and-neck with our returning champion, the Samsung 840 Pro and edging out the Corsair Neutron GTX in many benchmarks. In our sequential read and write tests using CrystalDiskMark, the Vector was nicked at the line by the Samsung drive, but it was a tight race, as the Vector sat right around 500MB/s for both read and write speeds, which is top-of-the-charts.

In our ATTO 64K compressible-data test, the Vector basically saturated the SATA interface, burying the needle at a 522MB/s write speed and 514MB/s read speed – again, bringing it neck-and-neck with the Samsung 840 Pro. This was the only test where the Vector had a clear advantage over the Corsair Neutron GTX.

When it comes to low-depth 4K queues,

PERFORMANCE

	OCZ Vector	Corsair Neutron GTX	Samsung 840 Pro	OCZ Vertex 4	Intel Series 520	Crucial M4
Controller	Indilinx Barefoot 3	LAMD LM87800	Samsung MDX	Indilinx Everest 2	SandForce SF-2281	Marvell 9174
Capacity	256GB	240GB	256GB	256GB	240GB	256GB
Price	\$300	\$260	\$270	\$255	\$260	\$240
CrystalDiskMark						
Avg. Sustained Read (MB/s)	497.3	438.1	517.7	452.2	478.2	404.5
Avg. Sustained Write (MB/s)	496.8	472.4	499.1	400.3	245	257.3
AS SSD						
4KB Read (IOPS)	6,500	6,906	6,917	6,475	5,793	5,091
4KB Write (IOPS)	17,758	16,938	16,582	15,997	17,213	13,837
ATTO						
64KB File Read (MB/s)	522.9	486.3	514	425.3	510.2	260.2
64KB File Write (MB/s)	541.5	348.9	542	383.2	318.1	284.9
Iometer						
4KB Random Write (32QD)	80,015	81,634	61,931	28,206	81,624	56,087
PCMark Vantage x64						
Overall score	74,005	73,494	56,608	38,251	66,991	61,758

the Vector ran slightly behind the Samsung drive in AS SSD, which is a 'worst case scenario' test that uses incompressible data and hits the drive with a small workload of four commands in a queue.

This is designed to test an average desktop user's workload, and we saw it trailing the Samsung slightly in read speeds but dominating in write speeds. When we increased the workload to a 32-command queue in Iometer, the Vector took second place overall behind the Neutron GTX at 80K IOPS, both of which are substantially faster than the Samsung 840 Pro.

The Vector took top marks in our real-world PCMark Vantage test with a score of 74K, with the Neutron trailing by a smidgen at 73K and the Samsung 840 Pro back at 56K. All three drives are smokin'-fast, but the OCZ is the fastest we've seen yet. But let's make it clear: at this time, the SATA interface is clearly the impediment to increased performance of an SSD not plugged directly into a PCIe slot.

The upshot is that the OCZ drive freaking rocks – it's the fastest SSD we've ever tested. It performed impressively in every single test we ran. There's very little for us to complain about, which is rare. Of course, we can point to the high price, but that's around 10% higher than the Samsung 840 Pro's cost, so it's not totally outrageous.

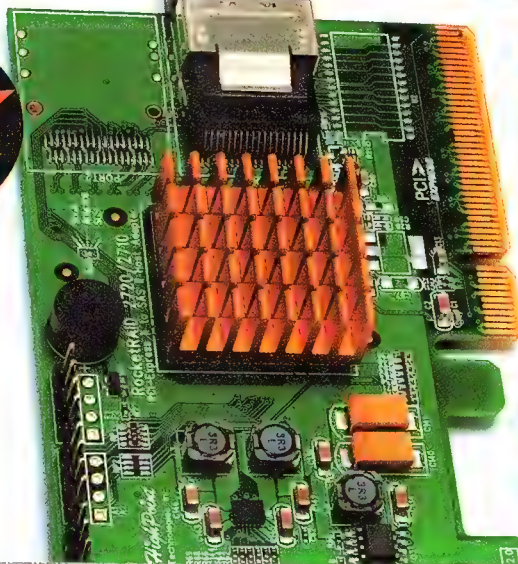
It seems that if you want this level of performance you've got to pay a premium for it. But also keep in mind that the Corsair Neutron GTX costs a bit less than both the OCZ Vector and the Samsung 840 Pro, and offers extremely comparable performance. That said, the Vector is a victor, and you have our clearance, Clarence, to use it in your rig.

Josh Norem

Our current SSD test bed is a 3.4GHz Core i5-3570K processor on an ASUS P8Z77-V Premium motherboard running Windows 7 Professional 64-bit. All tests used onboard 6Gbps SATA ports with the latest Intel drivers.



The Vector is the first to use OCZ's very own Barefoot 3 controller, and the company has certainly done its homework on this one.



PERFORMANCE

	WD 1TB Black	OCZ Vertex 4	1 SSD and 1TB HDD	2 SSD and 1TB HDD	3 SSD and 1TB HDD
CrystalDiskMark					
Avg. Sustained Read (MB/s)	139.2	464	368	630.3	969.6
Avg. Sustained Write (MB/s)	138	500.6	423	830.1	737
AS SSD					
4KB Read (IOPS)	166	6,876	1,900	1,902	2,037
4KB Write (IOPS)	234	16,452	12,974	13,344	14,454
ATTO					
64KB File Read (MB/s)	139.7	383	349	638	791
64KB File Write (MB/s)	139.4	497	447	805	895
HD Tune					
Average read (MB/s)	107.3	298.2	242	307	297.4
PCMark Vantage x64					
Overall score	5,933	43,748	37,674	44,438	46,032

All drives tested on our hard drive test bench: a stock-clocked Intel Core i5-2500K CPU on an Intel DZ77GA-70K motherboard with 4GB DDR3, running Windows 7 Professional 64-bit. All tests performed using native Intel 6Gbps SATA chipset with IRST version 10.1 drivers.

9/10 HighPoint RocketCache 3240x8

Takes SSD caching to a whole new level.

COMPONENT

www.highpoint-tech.com @

\$225 \$

SSD speed for any rotating hard drive, multiple configuration options, impressive speed.

Semi-expensive, not bootable. ✖

It's tough to wrap your head around HighPoint's RocketCache, so we'll try to sum it up as being simply crazy performance, if you're willing to deal with the configuration hassles.

The RocketCache is an x8 PCIe 2.0 card that lets you connect up to four SATA devices to it via a Medusa-like cable with four SATA 6Gbps connectors on it. The card lets you run two HDDs with two SSDs for caching, or – more crazy – one HDD with three SSDs for *insane* caching. That's not all. You can select between maximum performance, maximum performance with cache protection, RAID 1 with two hard drives and two SSDs for caching speed (maximum performance and protection), and maximum protection, which is RAID 1 with cache written to disks. One important note is that this device is not bootable, which is very unfortunate.

To test the RocketCache, we grabbed a WD 1TB Black drive, two OCZ Vertex 4 SSDs, and one Intel 335 Series SSD, and we ran all tests in Maximum Performance mode, which takes roughly 22GB from each SSD and stripes it together into a 66GB cache. Like other caching products, the size of the 1TB drive remained unchanged, and the extra space on the SSDs not being used for caching – about 217GB or so – is also still available as individual volumes. Since each SSD has its own lane to send and receive data, the configuration is theoretically able to saturate the PCIe interface with up to 1,500MB/s transfer speeds, and we got very close to that in testing with all four drives connected.

First, we connected just the hard drive by itself, and then

the Vertex 4 SSD by itself, and ran our tests to show you what each drive is capable of by its lonesome (see the table above). We then ran the HDD with each SSD added, one at a time, and ran our tests several times in order to see if performance would improve as the card began to cache the data used in the tests. Sure enough it did, and each successive test run showed us increasing speed until we hit a ceiling. It didn't take long for the 1TB hard drive to become as fast as an SSD, and in many cases performance surpassed that of the lone Vertex 4 SSD, which isn't surprising.

As an example, when we ran HD Tune on the one-SSD-plus-1TB combo, we initially saw the drive hit 107MB/s sequential read speeds (the same score it hit on its own), then 169MB/s on the next run, then 194MB/s, and on it went all the way up to 242MB/s. PCMark would also show us a 'drive-only' score first, around 5,000, then jump to 40,000 – a huge increase.

In other words, the RocketCache works as advertised. The only problem is: who would use this device? We don't see it being used with three SSDs, due to expense (small, fast SSDs aren't that cheap), though if you can swing it you'll be a happy camper. The more interesting aspects are the RAID 1 options, which grant you huge drive security with the safety of RAID and the speed advantage of drive caching. This is a truly unique combination of performance and security, and makes the RocketCache an interesting product that would kick ass if only we could boot from it.

Josh Norem



8/10 Creative Sound Blaster ZxR

The sound card is back — but does your PC need one anymore?

COMPONENT

au.creative.com @

\$329.95 \$

Far better gaming audio than onboard. ✓

Default audio settings are far too heavy-handed. ✗

If you think of your PC as a lifeboat full of components floating in the Atlantic Ocean after one of those ARM-based subs put two fish into the side of the PC's troop transport, you can better understand the plight of the sound card. With limited supplies and a thousand nautical miles to get to land, who do you think the CPU, GPU, mobo, RAM, case and HDD picked to throw overboard? Yup. Sound card gets to join modem, Ethernet card and MPEG-2 decoder in Davy Jones's PC, which by the way has a hell of a mod to make it look like a locker.

Well maybe, just maybe, the sound card still has a few tricks left in it. That's what Creative is promising with its new line of Z-series cards. The line comes in the Z, Zx, and ZxR trim. The \$130 SB Z is rated at 116dB and comes with a beam-forming mic, the \$200 Zx version adds a nifty Audio Control Module that features both 3.5mm and 6.35mm mic and headphone ports, as well as a large volume knob and microphone array. The top dog is the ZxR. For a hefty \$330 you get the ACM plus a daughter card with higher-end, pro-grade analogue digital converters as well as optical and RCA S/PDIF inputs and outputs. The ZxR card also uniquely features swappable Op-Amps, heavy-duty ground planes, and Burr-Brown digital analogue converters rated at 127dB. Once the sound gets out of the card, Creative rates it at 124dB, though. All three cards support 600-ohm amps to drive really big cans, too.

The processor is Creative's Core 3D chip, which the company says is a quad-core DSP with 1,200 MIPS. That sounds like a lot, but the 20K1 chip in the Creative X-Fi boasted 10,000 MIPS. But such is the way of the PC. With quad-core processors standard and six- or eight-core CPUs goldbricking, there's not much need for excessive amounts of processing power on a sound card. The old paradigm of benchmarking for frame-rate comparisons in a sound card is, frankly, outdated.

What matters most is how it sounds. Sound card reviews have taught us that memory for audio isn't as good as our memory of how things look, so immediate A/B testing is the only way to ever test audio. Rather than put the ZxR against

another sound card, we put it against its likely competitor — integrated audio — using the high-end ASUS P8Z77-V Premium board with Realtek ALC898 codecs. We tested using 24-bit/96KHz audio files as well as Blu-ray encoded audio. Finally we tested the card in several games, including *Hitman: Absolution* and *Call of Duty: Black Ops II* multiplayer.

One thing struck us immediately: the ZxR tries too hard. On default, the card seems tuned for, well, younger tastes — kids who like music turned up really loud with a boatload of bass. On more delicate music selections, the card is too heavy-handed. With the sound tweaked for our tastes, however, the audio was cleaner than integrated with less of the metallic rasp cheaper motherboard audio can have. We also preferred the ZxR for movies — but again it needed to be tweaked to reduce the bass, which tends to make everything a bit muddy.

In gaming, the ZxR had the clear edge in *Hitman: Absolution* — switching from the onboard to the ZxR was almost as pronounced as going from mono to stereo. We were particularly anxious to give the card's Scout Mode a spin — this specifically amplifies footsteps to give you an 'edge', theoretically, in gaming (no, it's not really cheating). Unfortunately, it didn't help us at all in *CoD: BLOPS2*, but we also admit it could be the underlying audio engine in the game that was unimpressive to us. We'll have to go through a larger library before we can pass a final verdict on Scout Mode.

So, where does the ZxR stand? If we had an existing add-in card, such as the still-excellent X-Fi or ASUS Xonar, we wouldn't upgrade. But if your motherboard has the worst sound implemented in history (and a lot of them do), it's time to go discrete, and the Z or Zx are good choices. The ZxR is best suited only for those looking for high-end audio-input needs.

As it is, we think the sound card still has some life in it. It's not a given that it'll continue forever, but we think slotting in a sound card is a value-add, no matter what your friends or your PC budget tell you.

Gordon Mah Ung



8/10 Cooler Master Seidon 120M

How does it stack up against the competition?

COMPONENT

www.coolermaster.com @

\$75 \$

Affordable, easy installation. ✓

Similar performance to an air-cooler when quiet, but loud when the fan's turned up. ✗

With the majority of closed-loop water cooling kits based on either Asetek or CoolIt designs, Cooler Master's Seidon 120M stands out from the crowd. It's one of the more affordable kits we've seen, and though it's not the answer to all our prayers, it proves you don't need to spend a lot to get a decent unit.

Like its competitors, the kit includes all the usual suspects: a prefilled aluminum radiator with a 12cm fan, copper contact plate, two tubes to shuttle coolant back and forth, and a pump built directly into the CPU water block. Though the Seidon 120M looks a lot like Asetek-designed coolers, its water block/pump is noticeably more low-profile than others we've tested.

Installing the water cooler was mostly a drama-free affair. The 120M features a universal backplate with pre-attached screws (for use with sockets other than LGA2011). We ran into a little trouble differentiating between the AMD and Intel clips, and labelling would have helped. Once we figured out which was which, we had no trouble attaching the clips to the base of the water block, securing them to the backplate and then mounting that on top of the CPU's heat spreader. Attaching the radiator to the chassis was also a walk in the park as we used the included screws to mount the fan to the radiator and

the radiator to our Level 10 GT chassis. The last step was to simply plug the power cable from the pump into the CPU header and connect the 12cm fan's PWM connector to a fan controller.

Once installed, the fan was very quiet with Q-Fan enabled in the BIOS, but under a heavy thermal load at 4.2GHz on our Core i7-3960X, it didn't perform much better than a Hyper 212 Evo air cooler. When we ran the system at full speed, however, performance improved dramatically, running 6°C cooler under load but still 1°C hotter than the dual-fan Thermaltake Water 2.0 Pro. To its credit, the Seidon was quieter at full tilt than the Water 2.0, which sounded like a wind tunnel.

Though the Seidon only comes with one 12cm fan, we added a Thermaltake fan to test a push-pull configuration and saw a dramatic performance boost, putting it on par with the Water 2.0 Pro, but sadly noise output was equally loud.

If you're looking for a super-cool and quiet water cooler, it's not the Seidon 120M – it can be cool and quiet, just not at the same time. Cooler Master doesn't reinvent the water cooling wheel, but it's good value considering its performance is very close to much more expensive competitors.

Jimmy Thang

PERFORMANCE

	Cooler Master Seidon 120M (Performance mode)	Cooler Master Seidon 120M (Quiet mode)	Thermaltake Water 2.0 Pro (Performance mode)	CM Hyper 212 EVO (Performance mode)	Cooler Master Seidon 120M (Performance mode with two fans)	Corsair H80 (Performance)
Ambient Air	21.6	22.2	21.2	23.8	23.7	23.2
Idle Temperature	30.7	36.4	32.2	36.2	31.8	34.9
Burn Temperature	68.3	73	66.6	74	67.5	65.3
Burn – Ambient	46.7	50.8	45.4	50.2	43.8	42.1

All temperatures are in degrees Celsius. All tests performed using an Intel Core i7-3960X at 4.2GHz, on an ASUS Sabertooth X79 motherboard in a Thermaltake Level 10 GT with stock fans set to High.

TOUGH

MiniStation™ Extreme

Rugged Portable USB3.0/2.0 Hard Drive with Encryption

MiniStation™ Extreme is a rugged portable hard drive equipped with a unique wrap-around USB cable and optional secure hardware encryption. With USB3.0 support and backward compatibility with USB2.0, it works with both PC and Mac®.

MiniStation Extreme features US Military Standard shock protection. Its ruggedised chassis and specialised internal bumpers absorb and transfer shock away from the hard disk due to accidental bumps and drops from up to 2.3 metres.

MiniStation Extreme is available from Officeworks in three stylish colours in both 500GB and 1TB capacities.



U.S MILITARY-GRADE SHOCK PROTECTION



Awarded to Buffalo
MiniStation USB 3.0 1TB
by APC, June 2012

Shock Absorbers on Four Corners



Product Features



USB 3.0/2.0
Compatibility



Mil-Spec Shock
Protection



Integrated Flexible
USB Cable



Available Hardware
Encryption



TurboPC EX
Enhancement



3
Years
3 Year
Warranty



SecureLock
RAMDISK
Backup Utility
ECO Manager
TurboPC

www.buffalo-anz.com.au

Available now from

Officeworks

stores nationwide.

GO-ANYWHERE HEADSETS

Need a compact headset to match a gaming laptop?
Bennett Ring tests seven portable sets.

Gamers are obsessed with graphics, to the point where they often forget about another element in the gaming equation that's just as important. Game audio is crucial to placing you inside the virtual space, yet many gamers overlook the audio system entirely. Perhaps it's because gaming audio is now matched perfectly to the real world, and thus improvements are harder to notice. Whatever the case, scrimping on your audio solution is a great way to spoil the gaming experience. More importantly, poor sound also puts you at a disadvantage on the battlefield, making it harder to hear crucial audio cues and warnings.

Most gaming laptops include speakers that are supposedly higher quality than ordinary ones, but the truth is they're generally middling at best. If you're spending serious game time on your laptop, a set of decent gaming headphones is an absolute must. They come in a wide variety of flavours, but the first thing to look for is the connection type.

USB headphones include a digital sound processor (DSP), which acts just like the dedicated sound card found in gaming desktops, and may support flashy features like Dolby Headphone Surround or EAX 5.0. On the other hand, headphones with a 3.5mm headphone jack will use your laptop's onboard audio solution. The number one point of failure on headphones is the cable, so if you can get a set that has a detachable cable they'll be easy to fix.

Players who regularly use a VoIP application to coordinate their online assaults with friends will definitely want a headset that comes with a microphone, and noise cancelling models offer the clearest communications. Most gaming headsets are huge, so portability is another important factor if you're going to have to lug it around with you all day. Finally, most important of all is the sound quality. Generally the more you spend the better they'll sound, but if possible, always test a prospective set of headphones – or read a few reviews.

Astro A30

Premium price, premium quality.

Astro is known as one of the most expensive brands of gaming headsets, but unlike many products in this category, they're not a rip-off. Many gaming headsets are made by inexperienced companies, resulting in poor quality audio, but Astro has a strong reputation for delivering headphones that a sound engineer would be happy to use.

When you're on the road, the A30 can plug directly into your laptop via the 3.5mm stereo minijack, and they're small enough to easily fit in your bag. However, when you've got the time and space to do so, it's best to plug them into the included wireless receiver. This then communicates with a USB base station that's slightly larger than a pack of cards, and is used to deliver Dolby Digital 7.1 audio over the stereo headset, even if your laptop doesn't have this feature. It's basically a large external sound card, and is far superior to the cheap integrated solutions used in most laptops. In this arrangement the A30 pumps out exquisite audio, and the surround sound effect makes locating foes a breeze. The same base station can be used with the Xbox 360 or PlayStation 3 to deliver surround audio over headphones.

Twin microphones are included; an in-line mic for use when you're not using the base station, and a boom mic for when you are. For such a small set of headphones the audio quality is excellent, and the light weight makes them very comfortable.

The only problem with the A30 is the wallet-searing cost. They're incredibly expensive, and at this price it's possible to buy even better audiophile-grade headphones. But the difference here is the powerful Dolby Decoder base station, and many gamers are willing to pay a premium if it makes them more effective on the virtual battlefield.

@ www.astrogaming.com

✓ Excellent sound quality, powerful Dolby Decoder, wireless transmission. ✗ Look at that price.

9
10

\$230

EDITOR'S
apc
CHOICE

i DOLBY DIGITAL 7.1

WEIGHT 188G

CONNECTS VIA 3.5MM,
USB OR SPDIF



i BLUETOOTH CONNECTION
34MM NEODYMIUM DRIVERS
BUILT-IN RECHARGEABLE BATTERY (NON-REMOVABLE)

Creative WP-350

Cable free, provided you've got Bluetooth.

- @ au.creative.com
- ✓ Very portable, wireless connection, solid sound quality.
- ✗ No Bluetooth dongle, narrow sound stage, sound effects can crush in hectic scenes.

Times have changed for Creative. 10 years ago nearly every gaming PC on the planet had a Creative Sound Blaster sound card, but with the introduction of motherboard audio chipsets and Windows 7's revolutionary changes to audio hardware support, the company has had to fall back on its other audio products to survive. Does the WP-350 exhibit the same quality of the beloved Sound Blaster range, or are they a desperate attempt to remain relevant?

Designed for use primarily with smartphones, tablets and handheld gaming devices, the WP-350 uses Bluetooth to supply wireless connectivity. If your gaming laptop doesn't include Bluetooth, you'll need to fork out extra for a Bluetooth USB dongle.

The headset itself is extremely lightweight, and the ear cups are smaller than the user's ear. Faux leather padding keeps each cup sweat-free while the adjustable headband ensures a tight fit. Tucked away inside one earpiece is a hidden microphone, which did a surprisingly good job for voice commands when we tested it with TeamSpeak.

Even more surprising is the audio quality. For such a dainty set of headphones we were extremely impressed at the sound on offer. Bass in particular is incredible, especially considering the drivers (the small speakers in each earpiece) are a mere 34mm across. Music sounds excellent, as do movies, but full-on action scenes can overwhelm the speakers a little, with distortion if things get too loud. The sound stage is narrow as well, lacking the wide open feel of other headphones.

We were pleasantly surprised by the Creative WP-350 headphones. With the convenience of wireless, extremely small dimensions and above average audio, they're a tidy set of headphones for gamers. The price tag is rather high though, but that's the price you pay for removing the tangles of a headphone cable.



i 40MM NEODYMIUM DRIVERS
IN-LINE MICROPHONE
3.5MM STEREO MINIJACK CONNECTION

SteelSeries Flux

Can they match the SteelSeries mice?

- @ www.steelseries.com
- ✓ Good sound quality, great looks, detachable cable.
- ✗ Lacking bass, no sound processor.

If you've read our mouse roundup you'll see that the SteelSeries mice are our favourite new pets. Mice and gaming headsets don't have a lot in common though, so whether the company can deliver a set of headphones that will tickle your eardrums as much as their mice tickle the fingertips is debatable. Let's see if the budget-oriented Flux headphones fit the bill.

Trendsetters will dig the available colour schemes, with the white, red and green headsets all looking retro cool. The main headband folds at either end for compact travel, and also extends to ensure a proper fit. There are two 3.5mm headphone ports on the headset, and the main cable detaches for easy replacement. The unused port can then be used to split the sound source off to another set of headphones – great if you're travelling with a partner who wants to watch the same movie on a laptop. An in-line mic is built into the detachable cable, and lacks any kind of mute or volume control.

Each earpiece is covered in fabric, but it's a little rough compared to the felt or faux leather material usually used. They're about the same size as the user's ear, so don't enclose it entirely, as it can lead to audio leaking in and out of the headset. Each earpiece houses a 40mm driver, which is larger than most portable headsets. The sound quality delivered by these is rather good, with a nice warm sound that remains clear at high volumes. They're a little lacking in bass, but provide excellent directional audio when paired up with a Dolby Headphone source.

At the \$90 recommended retail price, these headphones will probably appeal firstly for their retro design, with audio coming a distant second. The audio quality is good, but at this price, we expected it to be great.

9
10

\$230

- i USB CONNECTION
- NOISE-CANCELLING MIC
- 50MM DRIVERS



SteelSeries Siberia v2 Frost Blue

Your new weapon of choice.

@ www.steelseries.com

- ✓ Beautiful build quality, stunning sound, includes USB sound source.
- ✗ No surround sound.

They might be very large by portable standards, but considering a lot of hipsters wear headphones this size when using an iPhone, we figured it'd be OK to bend the rules. The Siberia v2 headset is designed as a fully fledged hardcore gaming headset, yet the price tag is much less intimidating than their physical dimensions.

The larger headphone size means they can utilise a full circumaural design, where each earpiece totally encloses the listener's ear via leather padding. This blocks off all exterior audio, while also making the headphones quieter for people stuck sitting next to the user. A unique steel frame with floating headband is exceedingly tough, but the plastic earpieces look a little fragile. Show ponies will love the huge glowing blue LED that lights up each earpiece.

Tucked away inside the left earpiece is a retractable boom containing a noise-cancelling microphone, which can bend for precise placement. The entire unit plugs in via USB, courtesy of the included sound processor. Sadly there's no Dolby headphone support, but it does have a basic equaliser that can be tweaked via a software control panel.

So far, so good, but it gets better. The sound quality is simply brilliant. With booming bass bringing to life every explosion, it's amazing that the mids and high end can remain so clear. Fantastic for movies and games, their only weakness is music playback. Powered by twin 50mm drivers, it's obvious that SteelSeries hasn't scrimped on the component costs.

The Siberia v2s offer outstanding performance, along with an integrated sound source if your laptop is missing one. With the best audio in our roundup, the slightly higher price tag is easy to justify. If only they supported Dolby Headphone, they'd be absolutely perfect.

- i TWIN 3.5MM STEREO MINIJACKS
- 50MM DRIVERS
- FOLDABLE HEADBAND



8
10

\$45

Thermaltake Shock

Helping to avoid wallet-shock.

@ www.thermaltake.com

- ✓ Solid sound quality, very affordable.
- ✗ A little uncomfortable, all plastic construction.

Like the Siberia V2 headphones that preceded them, the Shock headphones stretch what is acceptable in a portable headset. These are basically as big as headphones get, but the handy inclusion of twin joints helps them fold down to fit into a felt case half the size.

Built entirely from plastic, the thick headband should cope with a few rough knocks before cracking. A hard pad on the top of the headband provides support, but it's not the most comfortable design around. Each earpiece is nice and big, making this a circumaural set, and they're lined with a comfortable felt finish that can get a little hot during the summer months. A boom microphone folds down from the left side, bending for better positioning.

The headphone cable is fixed to the headset, so there's no chance of replacing it if it decides to stop working. It's several metres long, and includes a small in-line controller that handles volume and mic muting duties.

We weren't expecting mind-blowing performance given the budget price tag, but the large 50mm Neodymium drivers suggested they'd be respectable. To our surprise playing a round of *Battlefield 3* sounded pretty good, with clear detail of every weapon in the midst of large battles. The low end is rather lightweight with minimal bass, while extremely high end sounds can get a little scratchy, but overall the audio quality is great for this price point. Especially nice is the wide soundstage presented by the Shock, projecting a wide open virtual space.

If money is tight and you want a very simple set of headphones, the Shock does a fine job. They're not the most comfortable cans in the world, but the audio quality at this price is hard to match.

6
10

\$53



3.5MM STEREO
MINIJACK
10MM NEODYMIUM
DRIVERS
CARRY POUCH
INCLUDED

Turtle Beach Ear Force M1

The only gaming earbuds around.

- @ www.turtlebeach.com
- ✓ Very small, excellent at blocking external sounds, great for music.
- ✗ Lacklustre performance in games and movies.

When it comes to portability, earbuds are hard to beat. Small enough to stuff into your pockets, a decent set can also be used with your music-playing mobile phone. However, since they lack the oomph of external headphones, the question is: can the M1s deliver the performance that gamers require?

The M1 uses an unusual design that sees the cable fold over the top of the user's ear when in use. This helps stop the cable pulling the buds out, so if you're playing physically active games that'll be a plus. A spare set of rubber fittings are included, which most people will probably use, as the default size are quite bulky. One benefit of this type of headphone is that it blocks out external audio much better than on- or over-ear headphones, so these could be preferable if you're gaming on a noisy train. There's a small in-line microphone, but there's no way to mute it.

Audio is delivered via twin 10mm drivers – much smaller than those found in other headsets. Despite Turtle Beach claiming these earbuds are engineered for games (whereas most earbuds are designed for music), we found their gaming performance wanting. With absolutely no bass to speak of, explosions and music with prominent bass lines lacked energy. The mids and high end were both extremely flat, lacking the crisp detail of better headphones. However, firing up a broad selection of music sounded much better, showing that they're really just standard earbuds. Human voices also sounded exceptionally good, which might make them OK for long RPGs with lots of dialogue.

Though they might be very convenient, the lack of gaming audio quality means we can't really recommend the M1. Well, unless the only genre you play is music games.

6
10

\$45



3.5MM STEREO MINIJACK
TWIN 40MM DRIVERS
IN-LINE MICROPHONE
WITH CALL ANSWER
BUTTON

Turtle Beach Ear Force M5

Cheap and, sadly, rather nasty.

- @ www.turtlebeach.com
- ✓ The price is right...
- ✗ ...but nothing else is.

Turtle Beach specialises in headphones, unlike most other headphone makers, so we'd expect their headphones to bring more to the table than their competitors' products. Yet we've had very mixed reactions to their products in the past; some of their top-end gear is great, but the cheaper gear tends to have issues. At just \$45, the M5 is definitely in the lower end of town, which doesn't bode well.

As part of Turtle Beach's mobile range, it's a little odd to see that these full-sized headphones don't fold up at all. There's no carry pouch included either, which is annoying. The plastic headband wraps around a metal backbone, which should keep it from breaking, and extends for those with extra-large noggins. A small felt pad on the top of the headband carries the weight, and they're not too snug.

Each earpiece is covered in thick fabric, with the connection cord permanently attached to the left cup. A small in-line mic is built into the rather short cable, and it delivered somewhat average-quality voice recordings during our VoIP test. A short splitter cable is required to use the microphone on a PC, which will very likely get lost during your travels, since it's quite small.

When it came to our listening tests, we found the performance to be less than impressive. The range of the headphones seems to be very focused in the mid-range, with a distorted high end and very little bass. There are other headphones around the same price that will make demanding eardrums much happier.

Once again we're reminded that Turtle Beach's budget offerings don't quite hold up to the same scrutiny as its premium range. We recommend you avoid this one if possible. [APC](#)

CORE GAMING GEAR

This month, *APC* tests every worthy CPU plus the full gamut of graphics cards, so you can build the ultimate gaming rig on any budget.

It should go without saying that we're big fans of the desktop PC here at *APC*. Say what you want about the convenience of the smartphone, tablet or ultrabook, there are some things you need a fully fledged desktop to do well – and gaming is one of them.

But the gaming PC could be about to enter a time of change. It's not just under attack from portable devices and gaming consoles, but new designs like all-in-one PCs – and even some of the desktop's traditional champions are seemingly trying to undermine it.

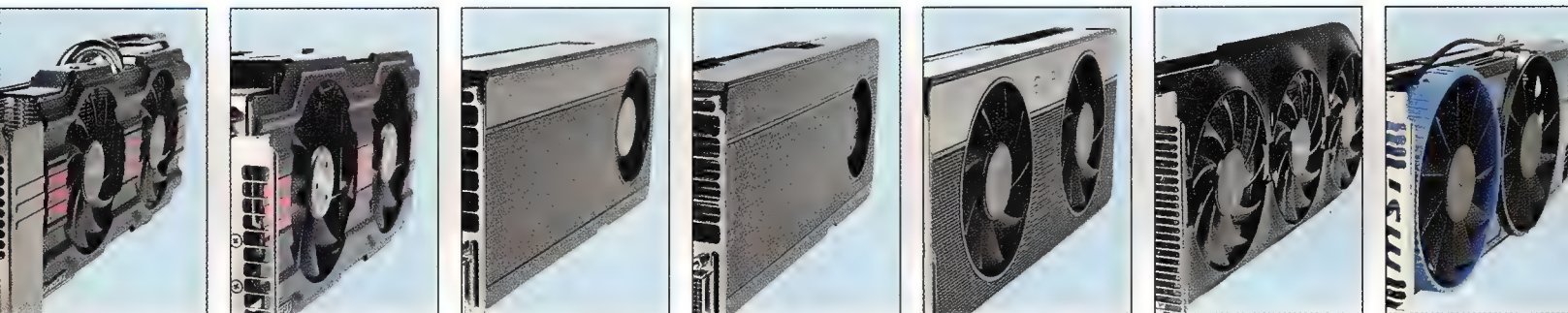
If the rumours are true, in 2014 Intel will change the way PCs have been built for over 20 years. A new CPU mounting mechanism, known as ball-grid array (BGA), will replace the socketed land-grid array (LGA) design, and likely means that CPUs and motherboards will no longer be sold as separate bits of kit because they'll be soldered together at the factory.

It's not time to panic just yet, however; you can still build a kick-ass gaming PC the way you want to today. And while there'll be new launches throughout 2013 (Intel's major refresh is due in June), the high-end components almost always launch first (at inflated prices). Waiting it out will likely mean waiting until the end of the year, or longer, for things to shake out again. Now is therefore a great time to build a gaming rig. There's a great selection of parts on offer, with both AMD and Nvidia offering a top-to-bottom range of up-to-date graphics cards to choose from, and there are some great-value CPUs from both Intel and AMD.

So whether you've got \$500 to spend or \$5,000, you should be able to find some suitably priced components here to help you build your best gaming rig ever.







GRAPHICS FOR EVERY GAMER

The new-generation lineup is ready. Dave James lays his cards on the table.

These things can take time, but at last this generation of graphics cards has been pretty much finalised. AMD did its part early on, having almost its entire lineup sorted by mid-2012, while Nvidia has been dragging its heels like a schoolboy who's forgotten his homework. However, the release of the GeForce GTX 650 Ti marks the completion of this generation of cards and despite the fact that it's taken nearly an entire year to get to this stage, things have never looked so good for the consumer.

It's somewhat inevitable that every generation offers more power for less cash than ever before, but it's still surprising that a card you can buy for less than \$160 will be able to deliver more than 30fps on average at full HD resolutions in the latest DirectX 11 titles.

It's strange then that people are calling these the end times for the discrete graphics card, what with all the advances in integrated CPU graphics performance. For us PC gamer end users though, our rigs have never looked so sprightly. Being able to pick up mid-range cards with the sort of performance the high-end cards of the past few years could only wish for is making our gaming experience the envy of the slaving console hordes.

Just look at the gaming shows of the past year, GamesCom and E3 especially. All the best-looking titles were being demoed on high-end PCs. Why? Because there's no way to get the games looking as good on the current generation of consoles.

With the next generation of those limited tech bricks not arriving until the tail end of 2013, the PC has an entire year of even greater gaming dominance. And by then, chances are it's still going to hold the technological gaming advantage.

But what of right now? Who are the winners and losers in the great graphics arms race? We've lined up the full range of gaming-capable graphics cards of this generation and we'll tell you where the smart upgrade money should go.

This has been a rather strange year in terms of graphics card releases. It all kicked off in a rather bizarre way just before Christmas 2011 when AMD 'launched' its Radeon HD 7970, despite only actually having stock in January 2012.

We could have understood AMD's desire to get the card in front of the tech press before Christmas if Nvidia was likely to have its brand-new card out soon after, but the green team was

a long way behind with its new GPUs – we'll get back to that later.

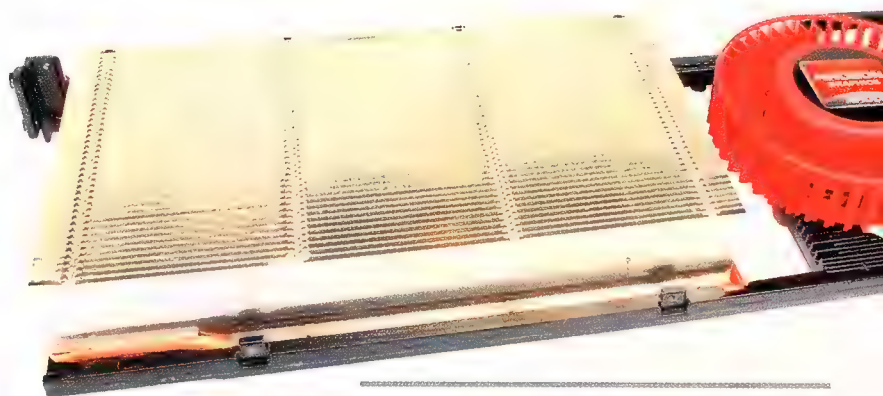
Still, the new top-end card arrived and it was (somewhat inevitably given the lack of Nvidia competition) the fastest GPU around. But it was a brand-new GPU architecture, in a year when AMD had also released a new CPU architecture with limited success.

That new architecture represented a strange flip in terms of the focus of each side's graphics card design. Rather than looking to continue with its standard, one-trick method of hitting gaming frame rates, AMD was now, with the Graphics Core Next (GCN) chips, focusing on nailing compute performance. That had been Nvidia's route with the previous-generation Fermi cards and now AMD was creating a very similar architecture to cope with the graphics engines of the day.

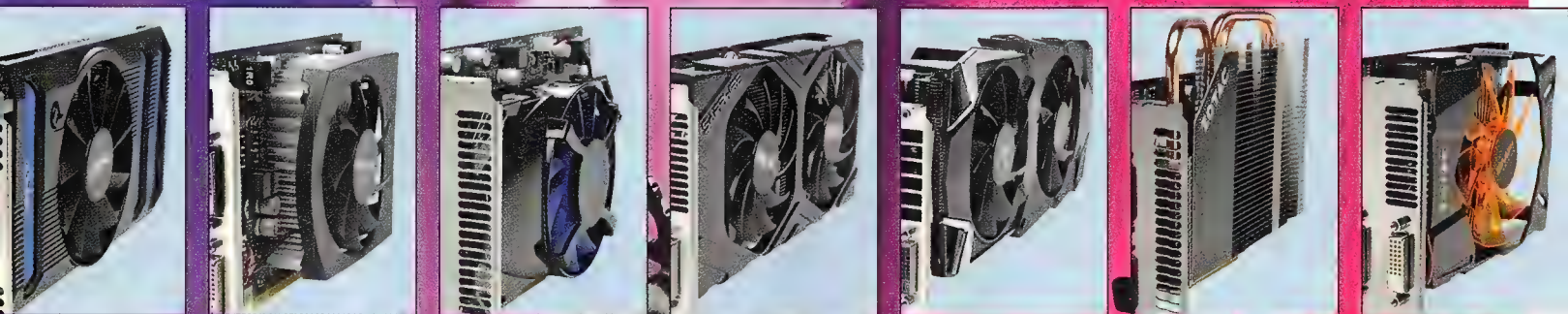
And then in March 2012, Nvidia dropped the K bomb: Kepler hit the streets with the GeForce GTX 680. Its new 28nm architecture had almost switched sides with AMD – the Kepler GPUs focused more on raw graphics performance than the general compute-focused Fermi cards that came before it.

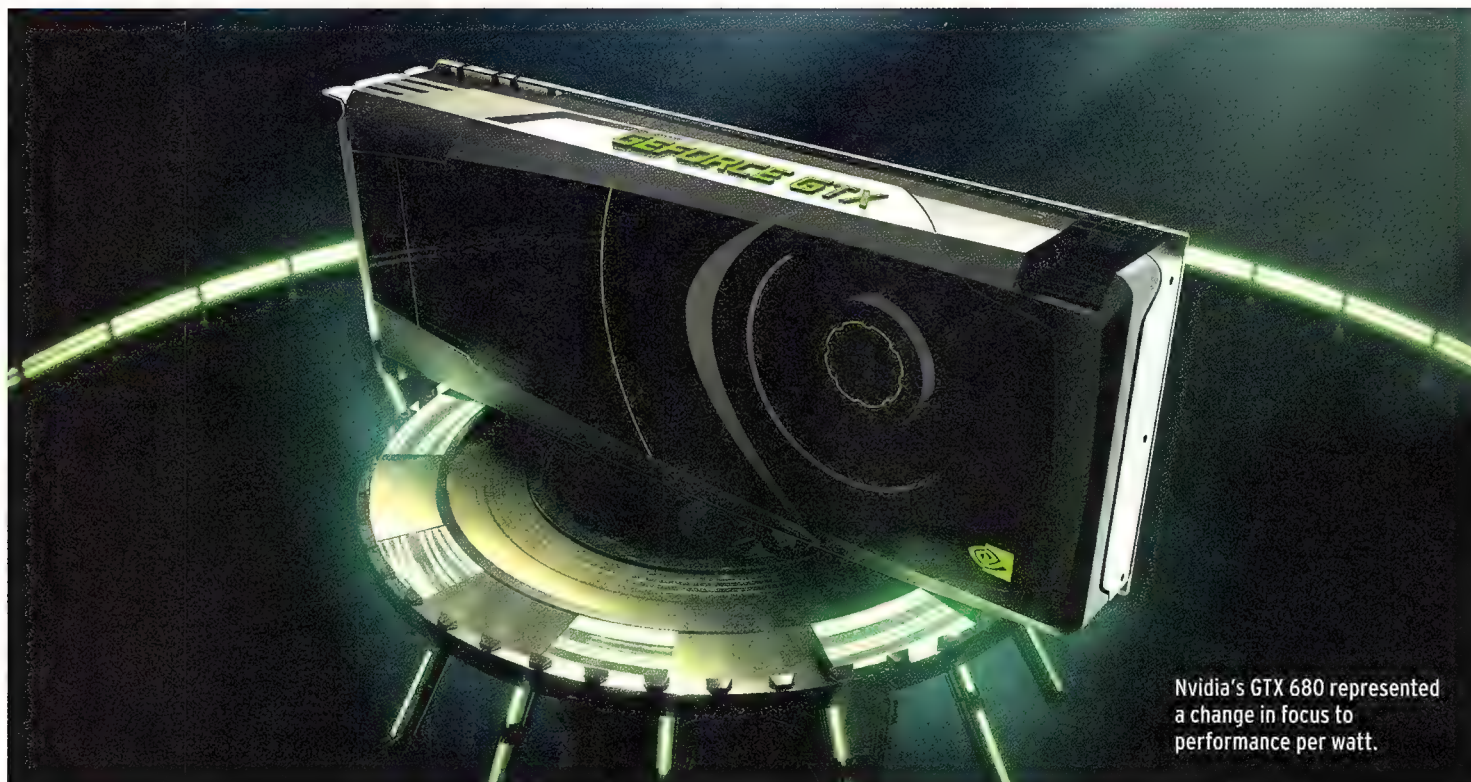
WHERE'S MY COMPUTE?

Nvidia has left a lot of the compute power out of the consumer-focused cards, preferring instead to jam the extra silicon necessary for such

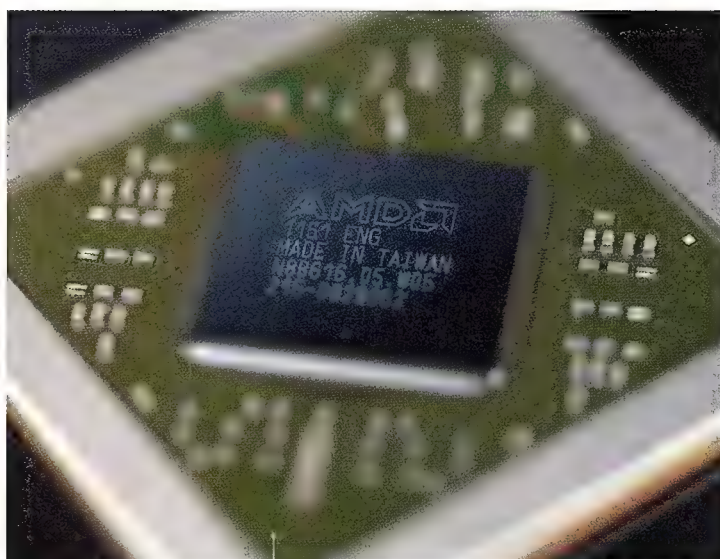


It takes this much cooling to keep a GCN GPU chilled.





Nvidia's GTX 680 represented a change in focus to performance per watt.



AMD's Graphics Core Next is just about the top GPU around.

JARGON EXPLAINED

GT3E. With Intel's Haswell there will again be different graphics SKUs. It's the top GT3E part Intel claims will be responsible for full Intel gaming laptops.

Sea Islands. This is the next range of GPUs coming out of AMD this year. It promises the next version of GCN and is meant to represent the improved efficiency its range is lacking at the moment, compared to the competition.

general-purpose calculations into the Tesla series of professional cards. That space-saving silicon design means the top consumer Kepler chip is an incredibly power-efficient graphics processor, with a TDP of just 195W compared to the 250W TDP of the competing Radeon HD 7970.

Nvidia's Kepler GPU also introduced the Intel-aping GPU Boost, which dynamically ramps the GPU clock speed depending on the power usage and thermal envelope. Now it was AMD's turn to play catch-up as it introduced the PowerTune Technology with Boost, which more or less did the same thing for its GPUs.

In terms of raw graphics performance, the top two tiers of graphics cards – GTX 670/680 and HD 7950/HD 7970 – are much of a muchness, trading performance leads in different game benchmarks. At the top then, it pretty much comes down to which card's feature set you prefer and which plays best with your favourite games.

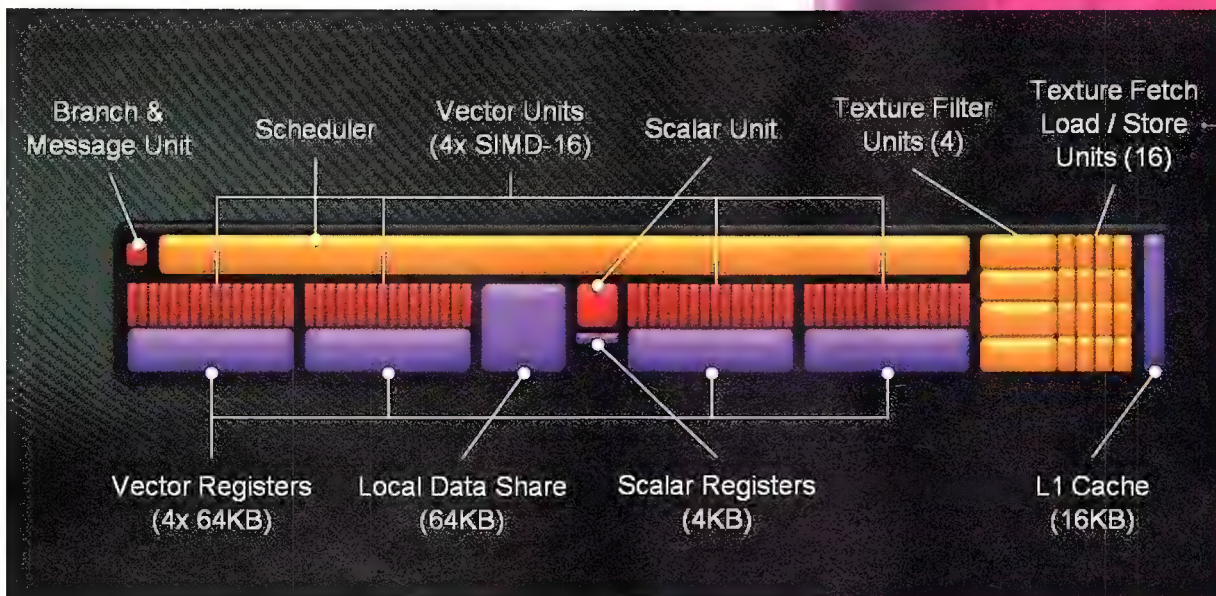
Things have become a lot less equitable in the lower echelons of the graphics card market. While AMD had released its full HD 7900, HD 7800 and HD 7700 series of cards into the wild by the end of March, Nvidia would take another seven months to actually flesh out its Kepler lineup. That meant AMD could keep its prices high while it was the only new kid on the block and then take an axe to its GPUs' price tags when Nvidia's rival cards finally touched down.

We'll probably never know the real reason for Nvidia's tardiness on its lower-end cards, but rumour has it that low silicon yields on its 28nm process had something to do with it. Nvidia just claimed to be waiting for the wealth of big games titles coming out at the end of the year. Whatever the truth of it, AMD is winning the price battle and has better cards available at every price point in the sub-\$400 market.

One of the big problems is the fact that there are few games out there at the moment that will really tax a modern GPU. If you've bought a card in the past couple of years and are still sitting on a native resolution of 1,920 x 1,080 or lower, then there's really not a compelling reason to upgrade. Chances are you'll still be hitting reasonable frame rates in the latest games and that means the upgrade market is a little flat.

If you're looking for a new graphics card, though, there has never been a better time to make the move because you can pick up an inordinate amount of pixel-pushing power for very little cash these days.

But are you still going to need a graphics card in your next PC? Both AMD and Intel are making great strides in the integrated graphics market with future generations of chips. However, AMD is segmenting things,



AMD rewrote its own rule book on GPU make-up.

The GCN10 may well find its way onto a desktop near you

leaving its top consumer chips (the FX range) without any graphics on die. Intel, on the other hand, is resolutely sticking its iGPUs in every chip it throws out, bar the crazy Sandy Bridge E side.

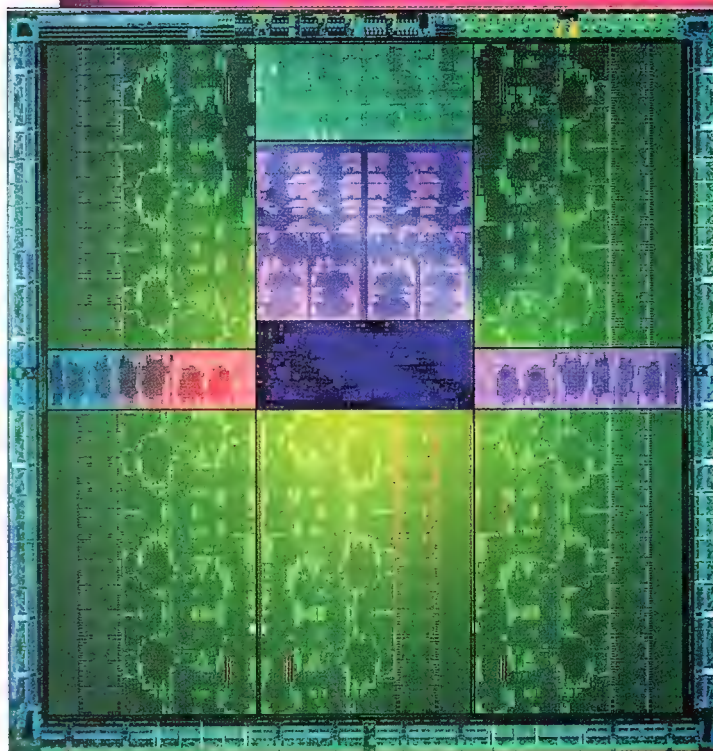
DISCRETE DAYS NUMBERED

With the processor upgrade to Haswell this year, Intel is predicting a doubling of its graphics performance in Ivy Bridge. In terms of gaming on the desktop, that still isn't going to give you the frames per second you'll need to get the most out of *Star Citizen Alpha*, but on the mobile side it's talking up the capabilities of the GT3E Haswell graphics. Speaking to the graphics guys at IDF last year, Intel seems to think it will be making dedicated gaming laptops without dedicated graphics cards a reality in the next generation.

With the next generation of AMD's APUs looking to include the proper GCN architecture as the GPU component, its new lineup could also make things sticky for the dedicated graphics side. With no concrete news yet of Nvidia's Project Denver – its own ARM-based gaming CPU with a full-fat GeForce graphics part – the green side of the graphics war is looking a little ill-equipped for the coming battle, at least on the PC.

The next generation of both AMD and Nvidia graphics cards will simply be building on the advances of their respective first 28nm parts, so we don't expect a lot of particularly interesting new tech this year, just a little faster and a little more efficient.

So that makes this generation even more interesting. These cards will consistently drop in price up to the launch of the slight upgrades of the HD 8000 and GTX 700 series of cards, and with the next generation of consoles not arriving until the end of the year, right now this is all the card most of us need. But which one is best for you?



MULTI-GPU?

Over the last few generations the multi-GPU performance of the graphics chips and motherboards has improved massively, to the point where now you're getting incredibly close to hitting the magic doubling of performance you'd want from doubling the amount you spend on a new pairing.

While the general performance has improved, we've struggled to uncover the hero card which offers a price/performance metric that would make us want to buy a pair of cards instead of spending the same amount on a single card.

However, the 1GB Radeon HD 7850 could be that card. We were surprised at the performance of the single card with its cut-down frame buffer, as you'll see from the reviews here. And the limitations introduced by that solitary gigabyte of GDDR5 VRAM will be mostly nullified by installing a second card with another 1GB frame buffer. At just \$380 for a pair, it actually comes in cheaper than some HD 7950s and should, for the most part, deliver better average frame rates than the single GPU.

Raw performance aside, there are other reasons we'd normally recommend going for a single GPU over a multi-GPU pairing and most of those come down to stability. Using graphics card pairings can be fraught with driver issues and game compatibility problems, especially on the AMD side. We've long had problems with CrossFire – more so than with SLI – and while the multi-GPU solutions are more and more robust, there'll still be times where you're waiting for profiles to be updated for the latest titles before you get the frame rates you've paid for.

i CUDA CORES: 1,344
LITHOGRAPHY: 28NM
MEMORY BUS: 256-BIT



7
10
\$450

ASUS GeForce GTX 670 Direct CU II

A reasonable second-tier Kepler card.

@ www.asus.com.au ✓ Great fps scores, impressive overclocking. ✗ The AMD HD 7970 beats this one.

Featuring an only slightly cut-down GK104 GPU compared to the top-end GTX 680, we were big fans of the GTX 670 when it first popped up. It was only a little slower than the top GeForce card and was much cheaper. It also had a performance lead on the HD 7950 and was on par with the original HD 7970. Time hasn't been kind to the GTX 670, though, and with prices staying relatively high since launch, its relevance has diminished. The new GHz Edition of the HD 7970 put it out in front of both top Kepler cards, and the Catalyst driver optimisations and more compute-oriented game engines have made the HD 7950 a rather tantalising prospect in comparison.

The part of the rival AMD GPU is played here by an ASUS card that's significantly cheaper than the GTX 670, now trading performance leads across our benchmarking suite. At about \$95 cheaper for the same sort of performance, it's a tough ask for this second-tier Kepler card. That said, it's more than capable of delivering great fps scores at high resolutions, so there's no reason to be down on it if you've got one in your machine. I'm still more than happy with mine.

But it's tough to recommend the GTX 670 to anyone looking to spend decent money on a graphics card. The HD 7950 will deliver the same sort of performance, in some cases significantly more, for a fair amount less cash. It's still got some impressive overclocking chops, but box fresh, the AMD card wins out.

i RADEON CORES: 1,792
LITHOGRAPHY: 28NM
MEMORY BUS: 384-BIT



8
10
\$355

ASUS Radeon HD 7950 Direct CU II

Impressive for under \$400.

@ www.asus.com.au ✓ Value, massive, triple-slot cooling array. ✗ Possibly too big.

There's a tremendous sense of value when you get this ASUS version of AMD's HD 7950 out of the box. It really is rather massive. The triple-slot cooling array means you're going to have to think long and hard about whether you've got enough space inside your PC chassis to house such a behemoth of a card.

It's not a bad little performer, especially at this price point. AMD has managed to be incredibly aggressive on pricing as new Nvidia-shaped competitors have hit the streets, and to have this sort of performance for much less than \$400 is impressive.

This card swaps performance leads with the more expensive GTX 670 across our benchmarking suite, showing that it has the chops at both high resolutions and in the more compute-oriented games/lighting engines we've started to come across.

The huge cooling array on this ASUS card means it can either run incredibly quietly or it can be overclocked to within an inch of its life. That will push it up towards the speeds of the original HD 7970 and keep it on par with the overclocking chops of the GTX 670.

Realistically, if you were to spend serious money on a graphics card right now – unless you were powering a couple of very high-resolution screens, that is – then we'd probably have to say the HD 7950 is the way to go. It's here at a great price, comes with excellent performance at the top end and this card offers some serious overclocking options, too.



CUDA CORES: 960

LITHOGRAPHY: 28NM

MEMORY BUS: 192-BIT



6
10

\$270

EVGA GeForce GTX 660 Superclocked

Not a bad option.

@ au.evga.com

✓ Performs well, good mid-range card.

✗ Second best, a little pricey.

When Nvidia finally got the GTX 660 out the door, it was all set to go head to head with AMD's HD 7850. That would have been completely right, as they offer similar performance figures. Among the Nvidia-favouring titles it does better, and vice versa with the AMD-centric games. Had the situation stayed static, then Nvidia's cards would've had their own place in the world. But AMD held its pricing at a level before Nvidia's mid-range hit the streets and thanks to its cards being out for a good while longer, AMD's been able to slash its price tags.

That means the straight GTX 660 is now going up against the vanilla HD 7870. Despite the overclocked nature of this EVGA card, it still can't beat the stock-clocked Radeon. Even on the Nvidia-sponsored games, like *Max Payne 3*, it's second best to the current mid-range king. When it comes to the compute-heavy Gaming Evolved titles like *Sleeping Dogs* and *DiRT Showdown*, the gap is huge. At standard 1080p settings in *DiRT Showdown*, it's a difference of 21fps on average between this and the OC Gigabyte card. That's a big difference and if you want decent performance across the most games, then the Nvidia mid-range cards are in trouble.

This card will still perform well at 1080p in most other games – usually hitting around 30fps – so it's not a bad card. Sadly for Nvidia, AMD has been able to get really aggressive on price and in the mid-range, that's what counts.



CUDA CORES: 1,344

LITHOGRAPHY: 28NM

MEMORY BUS: 256-BIT



7
10

\$350

EVGA GeForce GTX 660 Ti Superclocked

Needs a price drop to compete.

@ au.evga.com

✓ Quicker than the HD 7870.

✗ Not priced aggressively enough.

When we first saw the GTX 660 Ti from EVGA it was hovering around the \$400-\$420 price mark and was then bumping heads with the HD 7950, which was a battle it was never going to win. Unlike a lot of the other Nvidia cards, though, this has had a little price cut in recent times. Now it's available for around \$350 and while that does help the proposition, it's not quite enough to tip it over.

At this price it's too close to the HD 7950, when in performance terms it really should be smack-bang in the middle of the HD 7950 and the HD 7870. Broadly speaking, this is a quicker card than the HD 7870, especially the overclocked Gigabyte version we've looked at here. There are a couple of instances where it suffers by comparison, but then only very slightly. Interestingly, it's actually quicker than the HD 7870 in the traditionally AMD-centric *DiRT Showdown*.

Still, price is important and an overclocked HD 7870 can be had for less than \$300, with the vanilla HD 7870 for even less than that. At \$350 though, this mid-range Kepler card has basically priced itself out of the equation, with the HD 7950 outperforming it in almost every benchmark in our test suite (and when AMD doesn't outright win, the results have been almost too close to call). Hopefully Nvidia will drop the price on this one so it can compete with the 7950 a little better. That may be unlikely though, since Nvidia has a huge amount of goodwill from buyers willing to overlook AMD's fps leads and its Kepler cards are still selling well.

i CUDA CORES: 1,536
LITHOGRAPHY: 28NM
MEMORY BUS: 256-BIT



EVGA GeForce GTX 680 SC Signature 2

Impressive work.

@ au.evga.com

✓ Keeps up with the best, good results (at a price).

✗ Most expensive in the roundup.

The GTX 680 is still an impressive piece of technical engineering this far down the line. Released back in March 2012, Nvidia's current flagship card is still at the top of the graphics tree, duking it out with AMD's HD 7970 for GPU supremacy. That's impressive given the fact that its GK104 is a far simpler bit of silicon compared to the Tahiti XT behemoth in the AMD card.

The GK104 is a 3.5bn transistor chip versus the 4.3bn transistor Tahiti XT core and as such, is smaller and more power-efficient. That's quite a change compared to the Fermi generation, where the top GTX 480 and GTX 580 housed massive, power-hungry GPUs chock-full of CUDA cores and SM units.

The fact that this seemingly cut-down Fermi chip (the full-fat version is going into the professional Tesla K20 cards) can keep up with the top AMD GPU is impressive, as is its GPU boost and the frame rate targeting. What's less impressive is that Nvidia is charging so much for what is essentially the second-tier Fermi GPU, especially in this overclocked version from EVGA. At around \$700, it's a lot of money for a card that isn't quite the fastest available.

Compared with the GHz Edition of AMD's finest, the Nvidia card is routinely off the pace. It may be quieter, cooler and less power-hungry, but you're paying extra for things that have little bearing on your enjoyment of your games. If the pricing were reversed we'd still be lauding the GTX 680, but as it is, the AMD card gets the nod from us. As is the way with this generation.

i RADEON CORES: 1,280
LITHOGRAPHY: 28NM
MEMORY BUS: 256-BIT



Gigabyte Radeon HD 7870 OC Edition

Good, but the vanilla version is better.

@ www.gigabyte.com.au

✓ Price is right, good performance.

✗ Only slightly faster than stock.

When the HD 7870 first turned up in March 2012 we weren't that fussed about it. Sure, it delivered decent numbers in the benchmarks, but at about \$400 it was way overpriced and left us feeling rather cool towards this mid-range Radeon card. Thanks to Nvidia finally getting its act together with its own mid-range cards, AMD has started aggressively pricing and now the HD 7870s, and even this overclocked edition, are sitting below the \$300 mark.

At this price there really isn't anything Nvidia can do to compete. Now that the GTX 660 Ti's prices have come down, though, it does represent a little more competition for AMD's mid-range master. Still, the Pitcairn XT is pretty much all the GPU you need for your 1080p screen – it will throw polygons around at impressive speeds in any game you care to play. There's simply little point spending more than \$300 on a graphics card unless you're seriously ramping up your native resolution with a 2,560 x 1,440 screen. And in that case, we'd recommend looking harder at the HD 7950 or GTX 670 for that sort of panel – the GTX 660 Ti isn't going to quite deliver across the board at that resolution.

The only issue here is whether you really need to look at the likes of the overclocked HD 7870. This Gigabyte OC version is only slightly faster than the vanilla HD 7870 and is about \$20 more expensive. If you shop around you can find the stock-clocked card for around \$250 and that's a real bargain right now.

groundbreaker.

The industry's most groundbreaking SSDs just broke new ground. Engineered by longtime SSD experts, the OCZ Vector Series delivers a new level of performance, endurance, and reliability designed to enhance your laptop or PC experience. Imagine a computer that delivers superior responsiveness and sustained speed across a broader spectrum of file types than competing drives, and you've got yourself a Vector SSD. With groundbreaking SSD quality, and leveraging proprietary technology in every drive, the Vector Series is built to provide hard drive-humiliating performance over the long term. Don't settle on your storage, get a groundbreaker.

Backed with an industry-leading 5 year warranty.

Learn how OCZ Vector Series breaks SSD ground at ocz.com.



AUTHORISED DISTRIBUTORS:



Synnex Australia Pty Ltd
www.synnex.com.au



Melbourne, Sydney
australastore.com.au



ABT Distribution:
www.abt-computers.com.au



Multimedia Technology
www.mmt.com.au



PB Technologies:
www.pbtech.co.nz



iWay Computer (NZ) Ltd.
www.iway.co.nz

OCZ
OCZTECHNOLOGY.COM

the SSD experts!

i RADEON CORES: 640
LITHOGRAPHY: 28NM
MEMORY BUS: 128-BIT



MSI Radeon HD 7770 Power Edition

Very capable performer.

@ au.msi.com

✓ Faster than Nvidia equivalent, more shaders.

✗ Not quite up to 1080p gaming with all the trimmings.

This is as good as it gets if you're looking for a genuinely gaming-capable card at the sub-\$170 level. Granted, it's only just under \$170, but compared with the competing GTX 650, at this price point it's the gamer's only real option. The Heaven 3.0 benchmark is a great metric for comparing GPU performance in isolation of any marketing nonsense, or any company-specific extras, and the figures don't lie.

The HD 7770 is considerably faster than the GeForce GTX 650 in Heaven 3.0, with only *Batman: Arkham City* actually giving any parity of performance between the two cards. Across all the other benchmarks, whether at 1080p or 2,560 x 1,600, this AMD graphics card has a pretty significant advantage.

When you look at the different GPU architecture, it's easy to see why. The Cape Verde XT GPU of the HD 7770 has far more shaders on offer than the GK107 GPU at the heart of the GTX 650. Despite the fact that they both have the same size frame buffer, similar clock speed and number of ROPs, the extra Radeon Cores of the Cape Verde XT push its gaming performance numbers far ahead of the competition.

The HD 7770 is such a capable performer it's knocking on the door of the GTX 650 Ti, even the AMP! edition we're featuring here from Zotac. That's probably where Nvidia saw the match-up in the first place, but pricing and AMD have conspired against it. While you're not going to be topping 30fps at 1080p on the top settings, you won't have to sacrifice too much of the pretties to be able to hit that magic frame rate.

i RADEON CORES: 1,024
LITHOGRAPHY: 28NM
MEMORY BUS: 256-BIT



MSI Radeon HD 7850 1GB

Unprecedented results for a \$215 card.

@ au.msi.com

✓ High performance, on par with the 2GB version.

✗ None.

We have to admit this was a bit of a surprise. We wanted to get the 1GB version of the HD 7850 to test it against the HD 7770 more than anything else, assuming this would be the card it'd be going up against. After all, the 2GB frame buffer of the stock HD 7850 must be partly responsible for its impressive showing at high resolution, right? And that's putting post-processing such as antialiasing in the mix.

How wrong we were. It seems that the bottleneck to the Pitcairn Pro's performance isn't the memory at all – the GPU itself bottlenecks performance well before the memory gets anywhere near making things crawl. What does that mean? Well it means the 1GB version of the HD 7850, especially the slightly overclocked version supplied by MSI, is more than able to keep pace with the stock 2GB version of the Pitcairn Pro card.

As we were going through the benchmarking and the 1080p performance was staying resolutely high, we were expecting it to drop off a cliff as soon as we upped things to 2,560 x 1,600. Not so. We were still seeing it hit 40fps in *Batman: Arkham City* at the highest settings and a still pretty impressive 24fps on the top settings in *DiRT Showdown*.

For a \$215 card to be able to do that is pretty much unprecedented. This is the only card we'd recommend for a budget-busting multi-GPU setup for this very reason.



CUDA CORES: 384

LITHOGRAPHY: 28NM

MEMORY BUS: 128-BIT



6
10

\$130

PNY GeForce GTX 650

Ideal for little PCs.

@ www.pny.com

✓ Compact, cheap, good results.

✗ AMD equivalent performs better.

What both iterations of the GTX 650, in either this or the speedier, pricier Ti trim, have going for them is their diminutive size. They're both pleasingly small graphics cards, ideal for the wee PC. Well, ideal for the wee PC that you don't really have any interest in getting decent gaming frame rates from.

OK, that's a little unfair – the traditionally Nvidia-lovin' *Batman: Arkham City* will still let you top 40fps at 1080p at the top settings. Elsewhere, however, you're going to have to seriously tighten your graphical pretties belt in order to make sure you're getting decent frame rates. This is the same GK107 GPU we've seen in a number of laptops recently – that twin SMX GPU being perfect for the power-conscious mobile crowd – and if you're running a 720p screen at 1,366 x 768 or similar, then you're going to be able to get some decent gaming speeds.

On a desktop monitor, though, dropping out of the native resolution will leave you with rather muddy textures and HUD elements really encroaching on your gaming environment with tough-to-read text. The HD 7770 is therefore a much better bet if your wallet is limiting you to a \$170 maximum for your next GPU purchase and you're looking to stick to the native resolution of your current screen. You're going to have to make fewer graphical sacrifices to the gods of pricing with the AMD HD 7770 card than you will with this diminutive Nvidia GPU at the heart of your rig.



RADEON CORES: 512

LITHOGRAPHY: 28NM

MEMORY BUS: 128-BIT



5
10

\$120

Sapphire Radeon HD 7750

Cheap, but won't leave you cheerful.

@ www.sapphiretech.com

✓ Possibly OK for 720p gaming on a TV, low profile.

✗ Struggles to achieve decent frame rates.

This far down the pecking order of graphics cards, you'll really struggle to get anything close to decent gaming frame rates out of a normal 1080p screen. With the Sapphire HD 7750 you're not going to be pushing much past 20fps in most games without seriously knocking back the graphics settings or resolution.

This version of the HD 7750, with the 2GB of relatively slow DDR3 video RAM, is almost irrelevant in gaming terms. That said, you can pick up a low-profile version that could go into a small machine to stick under your TV. With Steam's TV mode and a drop in resolution, you'll be able to get almost gaming-capable speeds at 720p on your telly.

For another \$45, you can get double the gaming performance with an HD 7770, and an extra \$95 will get you the awesome HD 7850 1GB. If you're finding your budget stretched for a new graphics card, you'd be better off saving up for a little longer and paying a little more. The rewards for just that \$45 investment are pretty big in gaming terms.

At this low level the Nvidia competition is the GT 640, a graphics card that's not even permitted the GTX moniker. There's pretty much nothing between AMD and Nvidia at this range, so it would just be a case of choosing whether you might want a low-profile HD 7750 instead of the standard height Nvidia cards on offer. It's possible to get gaming frame rates at this price point, but the sacrifices to graphical fidelity might mean it's not really worth it.

i RADEON CORES: 1,024
LITHOGRAPHY: 28NM
MEMORY BUS: 256-BIT



Sapphire Radeon HD 7850 2GB

Outclassed by its own AMD siblings.

@ www.sapphire.com

✓ Cheap, great mid-range card.

✗ No extra speed compared to 1GB version.

The performance of the HD 7850 when it first came out, combined with its relatively low price tag, made for a very enticing mid-range card. That impressive start has only gotten better as time has moved on and the price has dropped ever lower. Once it dropped below \$300 it was hard to recommend anyone with a 1080p screen spending more.

Now its sub-\$250 graphics card crown has slipped as its HD 7870 big brother has usurped the HD 7850's place by making itself a whole lot cheaper than it used to be. Still, at \$240 you'd surely expect us to still be pretty taken with the HD 7850 and while it's still a great mid-range card, there has been one other sibling to make us take a second look. And that's the 1GB version of this GPU. You might expect the extra gigabyte of graphics memory to push this graphics card significantly ahead in the high-resolution benchmarks, but you'd be wrong.

On the other hand, you're not going to feel the fool for having one of these full-fat 2GB Pitcairn Pro cards in your rig. It falls a little short of the performance of the slightly pricier GTX 660, but only by a hair's breadth. In fact, in some of the more compute-centric benchmarks – usually the domain of the AMD GPU – the HD 7850 pulls ahead. But still, in terms of value for money at least, the Nvidia cards are failing to deliver in this segment.

The 2GB HD 7850 is still an impressive card, but it's the AMD family, both big and little brothers, that are pushing it out of the running.

i RADEON CORES: 2,048
LITHOGRAPHY: 28NM
MEMORY BUS: 384-BIT



Sapphire Radeon HD 7970 GHz Edition Vapor-X

The card for a high-res screen or three.

@ www.sapphiretech.com

✓ Fastest consumer card, good price for that.

✗ Power-hungry, loud.

The HD 7970 GHz Edition is the fastest consumer graphics card and the best news is it's not the most expensive. When Nvidia released the GTX 680, AMD was able to counter with the upgraded GHz Edition of its HD 7970, upping the clock speed to cope with the new kid on the block and retain its top GPU crown. This is the card to get if you're powering a high-resolution screen or three. It's got the graphics processing chops to run pretty much any game at 2,560 x 1,600 on the highest settings without batting a silicon eyelid. It may only be a little faster than the GTX 680 in most tests, but in the compute-heavy titles, such as the lighting-intensive *DiRT Showdown*, it has a clear lead.

That's because Nvidia and AMD seem to have swapped sides in the graphics tech war. Where Nvidia had traditionally gone for hot and heavy GPUs with an emphasis on compute power and AMD for low-powered, efficient, rasterising chips, they've now switched over. AMD's GPUs are now the compute beasts and the new graphics engines we've seen in *DiRT Showdown* and *Sniper Elite V2* use that to its fullest.

But the HD 7970, even this Vapor-X version from Sapphire, is a power-hungry and rather loud graphics card. You'll need a beefy PSU to cope with its demands and some decent chassis airflow to keep it cool. When you're looking at buttery smooth frame rates in the latest games, though, you're unlikely to be that worried. With money no object, this would be the single-GPU card for our gaming rigs.

QNAP



Easy installation

**TurboNAS
TS-269L**

**TurboNAS
TS-469L**

The new era for home entertainment

HappyGet



Easily back up online videos to the Turbo NAS and play music playlists with the Chrome web browser.

HD Station



Enjoy a Full HD movie experience on the big-screen TV via HDMI.

TV Station



Enjoy online TV watching, recording, and playback.

bluechip
infotech

CAIR Centre 1300 72 74 74
www.bluechipit.com.au

National
Harris Technology. 1300 13 9999

VIC
Scorptec Computers. 1300 72 6770
Centre.com 03 8311 7600
eStore 1300 658 600
Landmark Computer 1300 133 165
PC Case Gear. 03 9560 2122

NSW
Mwave. 02 9649 5187
Skycomp Technology 02 9011 2078
Techbuy Pty Ltd 02 9648 1818
CX computer. 02 9233 6288
Online computer 02 9211 0898

WA
Ple Computers Pty Ltd 08 9309 4771
Austin Computers 08 9201 2788

QLD
Media Players and More 07 5580 4508
Umart Online 07 33693928
PC Ezy 07 3359 6777
Beta Computer Services 07 3809 2999

SA
CalibreOne Pty Ltd 1300 368 171
ASI Solutions 08 8354 6200
SUBNET. 08 7127 9400

i CUDA CORES: 384
LITHOGRAPHY: 28NM
MEMORY BUS: 128-BIT



5
10
\$150

Zotac GeForce GT 640 Zone

Silence!

@ www.zotac.com

✓ Completely silent, cheap, good for media centre.

✗ Hard to get decent frame rates.

The main, indeed probably only, selling point of the GT 640 Zone is the fact that it's completely silent. With a chunky passive cooler sitting atop the GPU and memory chips, there are no spinning fans whirring away like a mini-turbine inside your PC. That means despite its standard card height, it would make a pretty decent media centre GPU.

Like the HD 7750, you'll struggle to get any decent gaming frame rates out of the card at standard 1080p resolutions and top settings, but lower your expectations and you'll be able to hit reasonable gaming speeds. Nowadays, lower settings in current games don't make them look much worse than their console counterparts, but still, for an extra \$50 you can pick up much more bona fide gaming cards. Unlike the HD 7750, we haven't come across any half-height versions for low-profile media chassis. That's definitely points in favour of the AMD side, but the passive cooling on offer with this Zotac card pretty much levels things out.

So at this level there isn't much between the two. It's just a choice of whether you want a low-profile card or a silent option. Either way, you're going to have to manage your gaming performance expectations at this bottom rung of the graphics ladder. Therefore the same rings true for the GT 640 as it does for the HD 7750: save up for a little longer and spend the extra either on an HD 7770 or an HD 7850 1GB.

i CUDA CORES: 768
LITHOGRAPHY: 28NM
MEMORY BUS: 128-BIT



6
10
\$220

Zotac GeForce GTX 650 Ti AMP!

This card really tries...

@ www.zotac.com

✓ Beats standard version, decent frame rates.

✗ AMD wins at this pricepoint.

So you thought things looked bad for the HD 7850 in standard 2GB trim when the 1GB version came out, but spare a thought for the poor old GTX 650 Ti. Bless its little silicon socks, it's really trying. Throwing off the shackles of the GK107 GPU, Nvidia decided to lumber the standard GTX 650 with this Ti version, which is rocking the same pumped-up pixel-pusher as the GTX 660.

That means it's actually much more of a reasonable gamer's graphics card than the standard version. Were it simply going head to head with an equivalently priced HD 7770, then it would have beaten the AMD card hands down. Sadly, it's all shifted around and this AMP! edition of the GTX 650 Ti sits in between the 1GB and 2GB versions of the HD 7850 in terms of price, and suffers by comparison with each of them.

At a little more than the stock 1GB version of AMD's mid-ranger, you could forgive the Ti for feeling just a mite suicidal.

Compared to the standard version of the GTX 650 it's a far superior component, offering decent gaming frame rates at 1080p resolutions, without making the end user sacrifice too many of the visual goodies we deserve. In fact, in *Batman: Arkham City* you're topping 40fps at the highest settings and that's with antialiasing. Still, there's no way to recommend this card over the AMD GPU.

Benchmark analysis

Making sense of a lot of numbers.

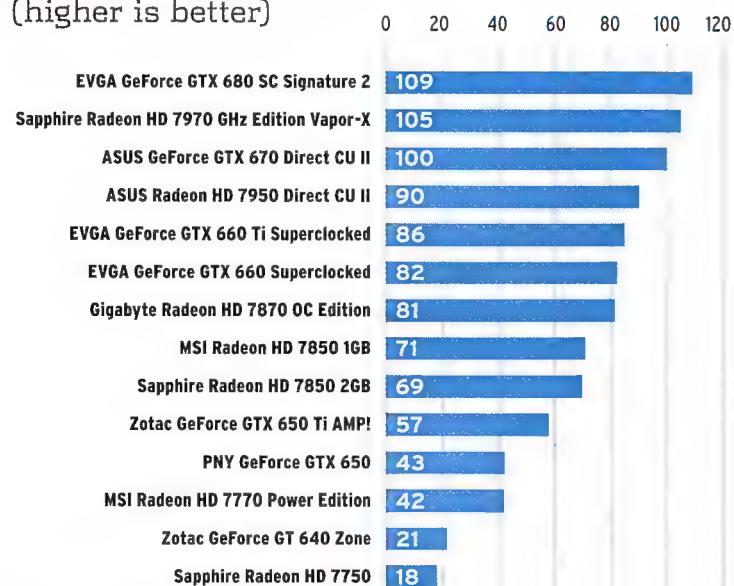
Given our penchant for high-performance components, it might seem strange that we've gone all gooey over a \$215 graphics card that's easily outperformed by a good chunk of the cards on test. But a quick scan of the benchmarks on these pages should show you why we're so taken by the HD 7850 1GB. It beats the other cards in its class in pretty much every test and gives much more expensive cards a run for their money.

In fact, as the two value tests prove, it offers the most performance for your dosh of the lot, and you can't ask for much more than that.

At the top of the tech tree, the HD 7970 and GTX 680 inevitably fight it out, each taking it in turn to top the test. Except when it comes to price performance – in both tests, the Sapphire offers far better value than the EVGA.

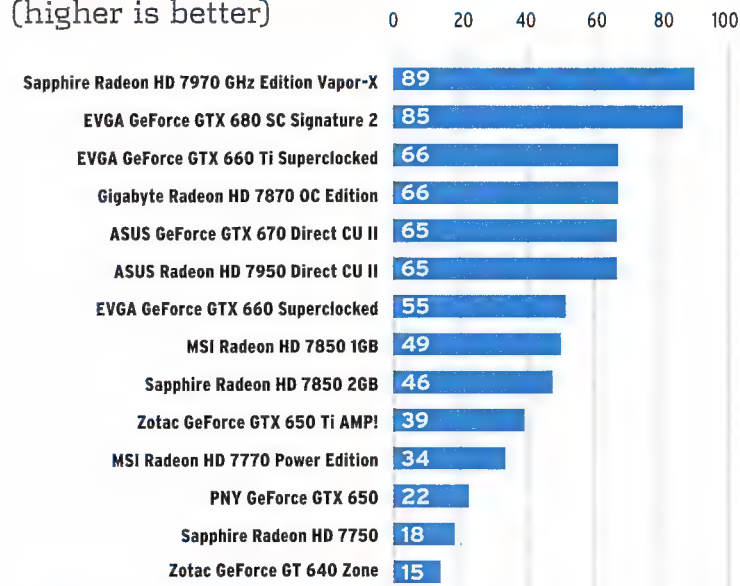
DIRECTX 11 GAMING PERFORMANCE (1,920 X 1,080)

Batman: Arkham City (fps)
(higher is better)



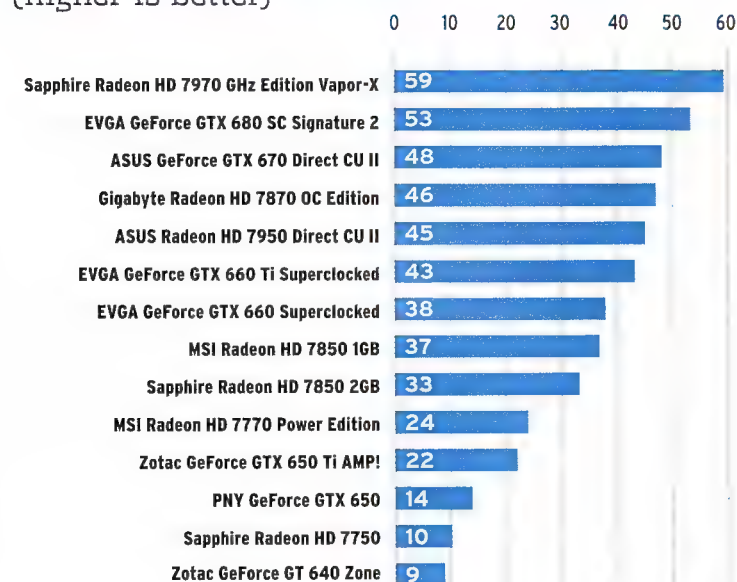
DIRECTX 11 GAMING PERFORMANCE (1,920 X 1,080)

Shogun 2 (fps)
(higher is better)



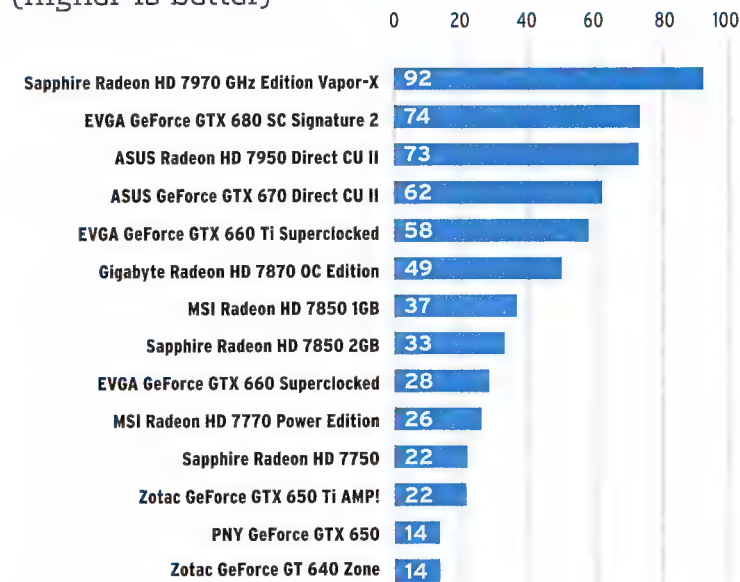
DIRECTX 11 GAMING PERFORMANCE (1,920 X 1,080)

Max Payne 3 (fps)
(higher is better)



DIRECTX 11 GAMING PERFORMANCE (1,920 X 1,080)

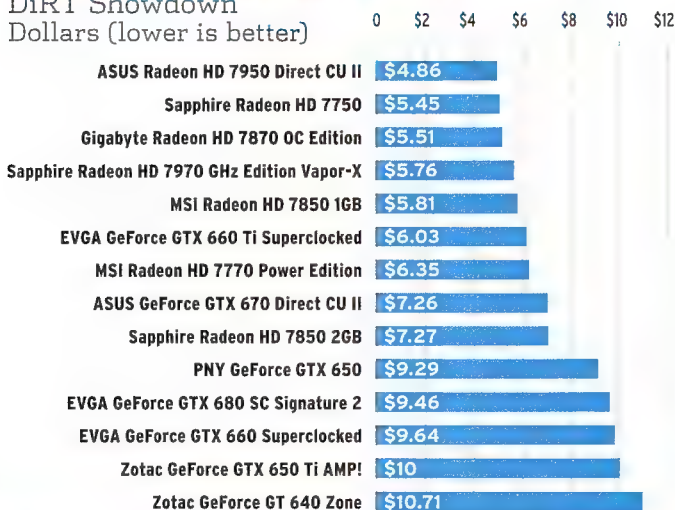
DiRT Showdown (fps)
(higher is better)



VALUE (PRICE PER FRAME/SEC)

DiRT Showdown

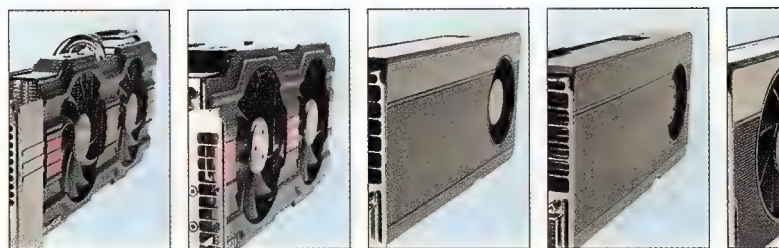
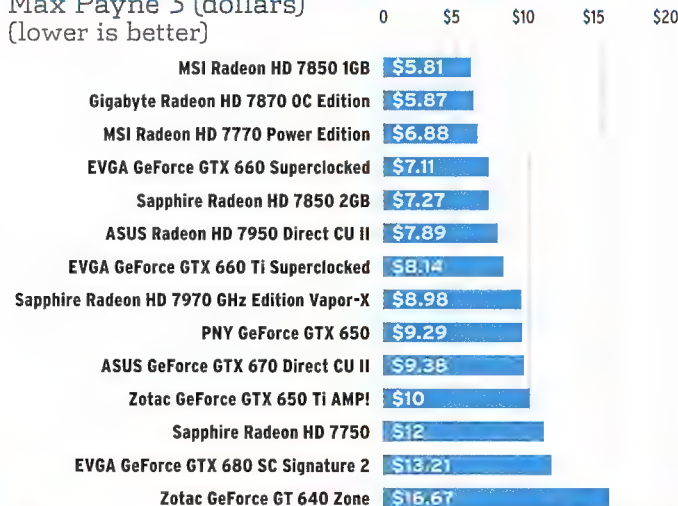
Dollars (lower is better)



VALUE (PRICE PER FRAME/SEC)

Max Payne 3 (dollars)

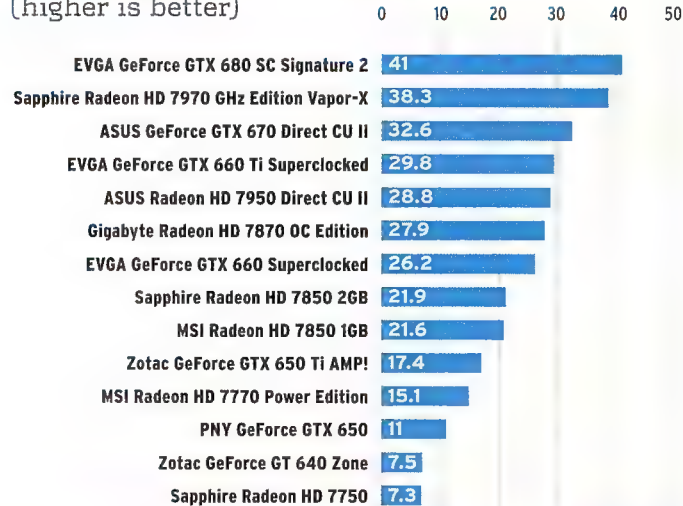
(lower is better)



BEST BANG FOR BUCK?

With so many graphics cards on the market, figuring out where each sits on the value tree is a tricky task. For this reason, we've not only benchmarked our test cards using latest games, but calculated the cost per frame for each card in two big games. This gives a completely unbiased measure of each card's overall value. You'll noticed that the cheapest cards don't always come out in front either, which is why it's best to go for a mid-range GPU.

DIRECTX 11 TESSELLATION PERFORMANCE (2,560 X 1,600)

Heaven 3.0 (fps)
(higher is better)


GRAPHICS CARDS: HOW THEY COMPARE

Product	Model	Price	Web address	GPU	Cores	Lithography	Clock speed	xFrame buffer	Memory speed	Memory bus
ASUS GeForce GTX 670 Direct CU II	GTX670-DC2-2GD5	\$450	www.asus.com.au	Nvidia GK104	CUDA 1,344	28nm	1,058MHz	2GB GDDR5	6,008MHz	256-bit
ASUS Radeon HD 7950 Direct CU II	HD7950-DC2-3GD5	\$355	www.asus.com.au	AMD Tahiti Pro	Radeon 1,792	28nm	900MHz	3GB GDDR5	5,000MHz	384-bit
EVGA GeForce GTX 660 Superclocked	02G-P4-2662-KR	\$270	au.evga.com	Nvidia GK106	CUDA 960	28nm	1,046MHz	2GB GDDR5	6,008MHz	192-bit
EVGA GeForce GTX 660 Ti Superclocked	02G-P4-3662-KR	\$350	au.evga.com	Nvidia GK104	CUDA 1,344	28nm	980MHz	2GB GDDR5	6,008MHz	256-bit
EVGA GeForce GTX 680 SC Signature 2	02G-P4-2687-KR	\$700	au.evga.com	Nvidia GK104	CUDA 1,536	28nm	1,097MHz	2GB GDDR5	6,208MHz	256-bit
Gigabyte Radeon HD 7870 OC Edition	GV-R7870C-2GD	\$270	www.gigabyte.com.au	AMD Pitcairn XT	Radeon 1,280	28nm	1,100MHz	2GB GDDR5	4,800MHz	256-bit
MSI Radeon HD 7770 Power Edition	R7770 Power Edition 1GD5/OC	\$165	au.msi.com	Cape Verde XT	Radeon 640	28nm	1,100MHz	1GB GDDR5	4,500MHz	128-bit
MSI Radeon HD 7850 1GB	R7850-1GD5/OC	\$215	au.msi.com	Pitcairn Pro	Radeon 1,024	28nm	900MHz	1GB GDDR5	4,800MHz	256-bit
PNY GeForce GTX 650	VCGTX650XPB	\$130	www.pny.com	Nvidia GK107	CUDA 384	28nm	1,058MHz	1GB GDDR5	5,000MHz	128-bit
Sapphire Radeon HD 7750	HD 7750 2GB DDR3	\$120	www.sapphiretech.com	Cape Verde Pro	Radeon 512	28nm	800MHz	2GB DDR3	1,600MHz	128-bit
Sapphire Radeon HD 7850 2GB	HD 7850 2GB GDDR5	\$240	www.sapphiretech.com	AMD Pitcairn Pro	Radeon 1,024	28nm	860MHz	2GB GDDR5	4,800MHz	256-bit
Sapphire Radeon HD 7970 GHz Edition Vapor-X	Vapor-X HD 7970 GHz Edition 3GB GDDR5	\$530	www.sapphiretech.com	AMD Tahiti XT	Radeon 2,048	28nm	1,000MHz	3GB GDDR5	6,000MHz	384-bit
Zotac GeForce GT 640 Zone	ZT-60204-20L	\$150	www.zotac.com	Nvidia GK107	CUDA 384	28nm	900MHz	2GB DDR3	1,782MHz	128-bit
Zotac GeForce GTX 650 Ti AMP!	ZT-61103-10M	\$220	www.zotac.com	Nvidia GK106	CUDA 768	28nm	1,033MHz	2GB GDDR5	6,200MHz	128-bit



AND THE WINNER IS...

MSI HD 7850 1GB

We get to test every single GPU on the market and we don't have to make decisions on what graphics cards to jam in our machines based on tribal loyalties. What we do base our decisions on is a combination of gaming performance and the cost to you, our readers.

In this generation it's been an almost complete whitewash for AMD in terms of performance per dollar, and actually in outright straight-line gaming speed, too.

Most of this is down to Nvidia's tardiness in releasing the new Kepler architecture into the wild, giving AMD the time to harvest its cards at the high initial price tags and then the option to slash prices when the competition finally comes around. At every pairing AMD comes out on top.

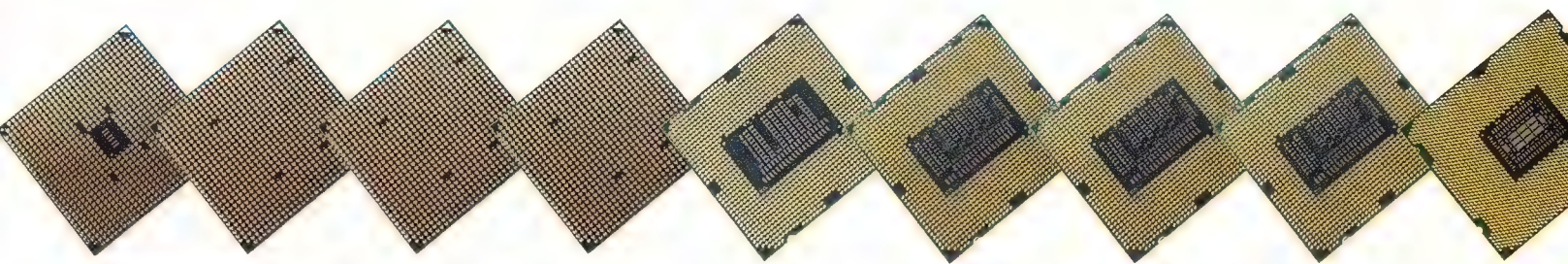
At the top end, the HD 7970 has held on to the performance crown thanks to the release of the GHz Edition – even the pricey, overclocked EVGA GTX 680 Signature 2 can't maintain a consistent performance lead over the AMD card. The price cuts have also allowed the HD 7950 to carve out an excellent little niche for itself, sitting between the GTX 660 Ti and GTX 670.

The GTX 660 Ti has become a little more relevant due to some price chopping on the part of Nvidia for a change. It's got enough about it to take on the HD 7870 and make a real fist of

it. However, the truth of it is that Nvidia actually hasn't had to make a fight on the pricing front. It's been happily selling its Kepler cards because of existing goodwill among its user base and that tribal loyalty sometimes outweighs the actual performance. If Nvidia is still selling at its current pricing, then there's really no reason to get any more competitive on cost. That's where AMD really has to fight its corner; after all, a quick check of the Steam hardware survey shows that Nvidia still has the advantage in numbers out in the real world.

The real star of the show, though, has to be the incredible HD 7850 in lightweight 1GB trim. We really didn't expect this MSI card to be quite as impressive as it is. We ostensibly got the card in to go up against the HD 7770, but as it turned out, it made things uncomfortable for the 2GB version, and for both the GTX 650 Ti and the GTX 660. In fact, for the gamer on a budget, the HD 7850 1GB is the perfect 1080p graphics card – it's got some impressive performance chops in high-resolution trim, too.

We've had a play with a pair of these in CrossFire and at \$430 you're getting performance that's right up there with the GTX 680 and HD 7970. The vagaries of multi-GPU systems in terms of playing nice with modern games mean it's still not an absolute must-buy pairing, but it's getting pretty darned close.



THE LAST OF THE SERIOUS CPUs

With mobile computing now dominating CPU design decisions, [Jeremy Laird](#) says this could be your last chance to pick up a separate desktop processor.

This is it, boys and girls. We're nearing the end of days for the PC processor as we know it. There are storms of change on the horizon and it's anyone's guess what the PC will be like in hardware terms when it blows over.

Right now, things are much as they've always been. You pay your money, you take your choice. In other words, you get to choose any CPU you like and match it with a motherboard and a graphics card. You've got both AMD and Intel options. And in many cases, you've still got full control over the chip you buy. You can overclock it, underclock it, swap it out and generally mess about with it.

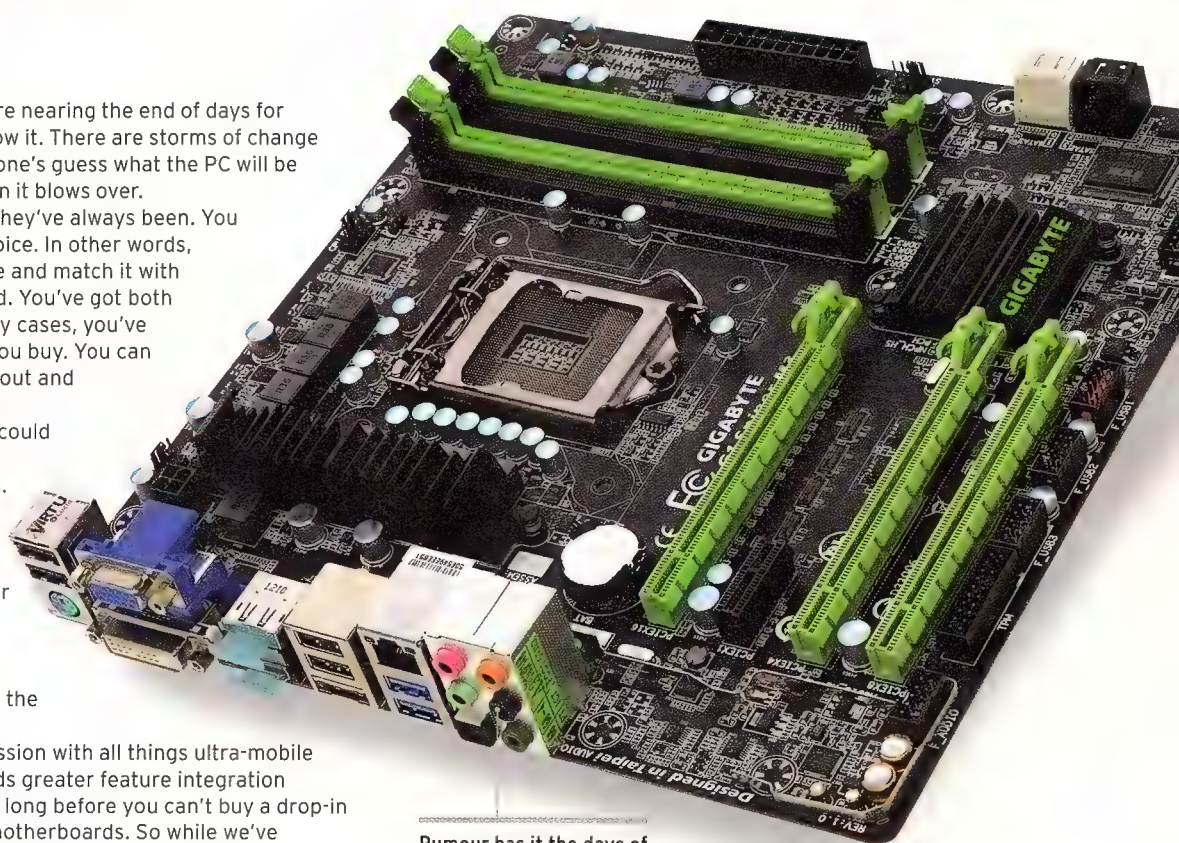
Trust us on this – much of that could begin to disappear within the next 18 months, so enjoy it while it lasts. Odds are at most there will only be a few more APC CPU supertests like this one. If you're wondering why, there are a number of trends at work. Firstly, AMD's position is pretty precarious. We'll come to that in more detail later, but AMD is truly teetering on the edge of oblivion.

Then there's the market's obsession with all things ultra-mobile and the technological trend towards greater feature integration that entails. Very likely, it won't be long before you can't buy a drop-in CPU. They'll come soldered onto motherboards. So while we've a few complaints about the current state of play in CPUs, there's a chance we'll soon be looking back on this as a golden age in terms of choice and flexibility.

So get out there and revel in it, we say. There are some great CPUs from both AMD and Intel that can still be enjoyed in true enthusiast fashion. They're fully drop-in-able. They're tweakable. They're fun. And the way the CPU market is going, they'll probably keep getting the job done for at least a couple of years.

Here we go again with a CPU roundup. Except this time, it feels like we're living on borrowed time. The PC is in a transitional period and five years from now much of what you take for granted when you spec up a rig will either be gone or very different.

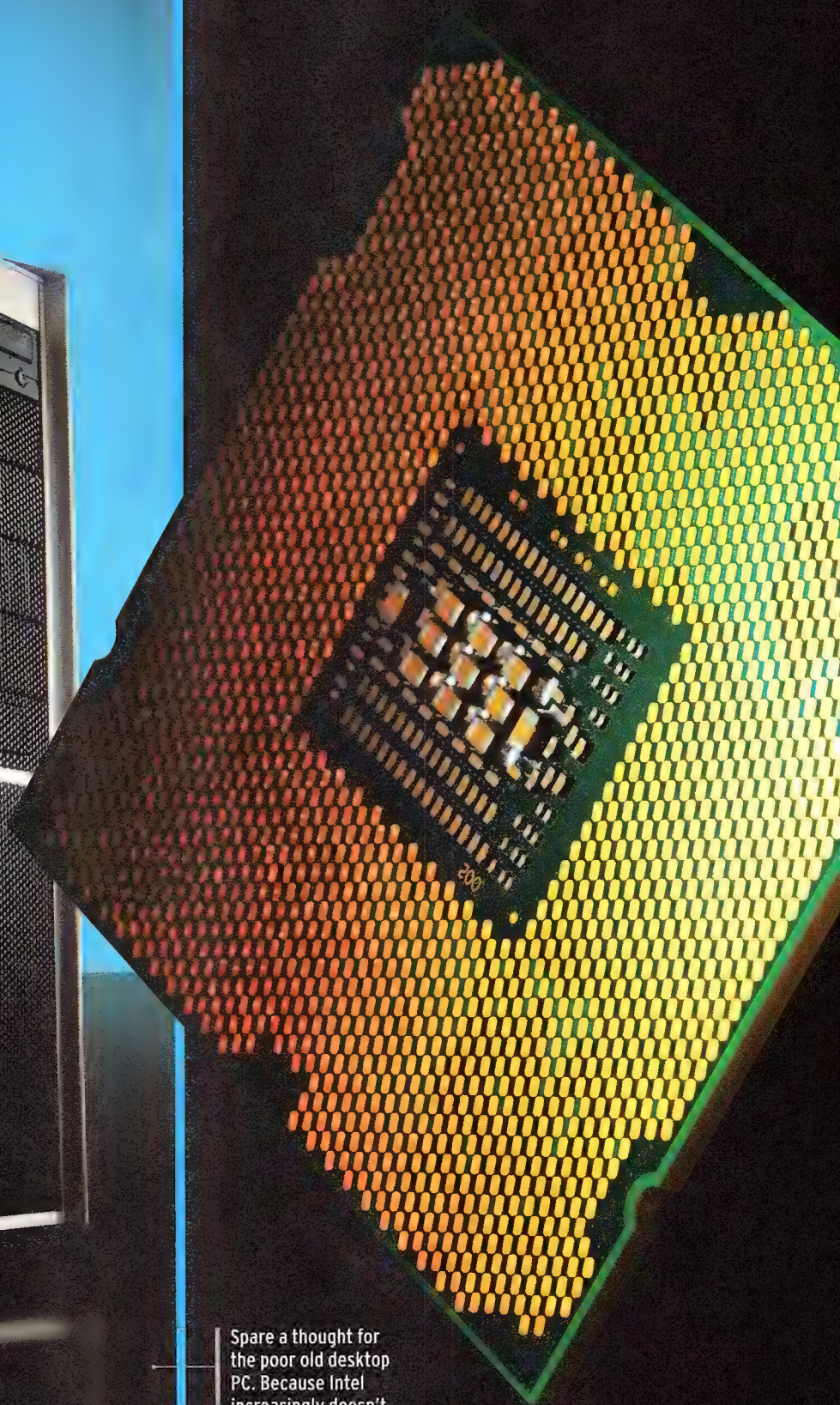
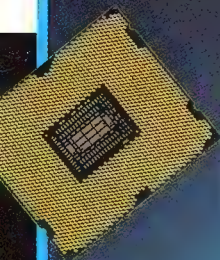
There are two major drivers here: the trend towards ultra-mobile and AMD's failure to really stick it to Intel at the performance end of the



Rumour has it the days of Intel LGA sockets are numbered. BGA and soldered-in CPUs are coming.

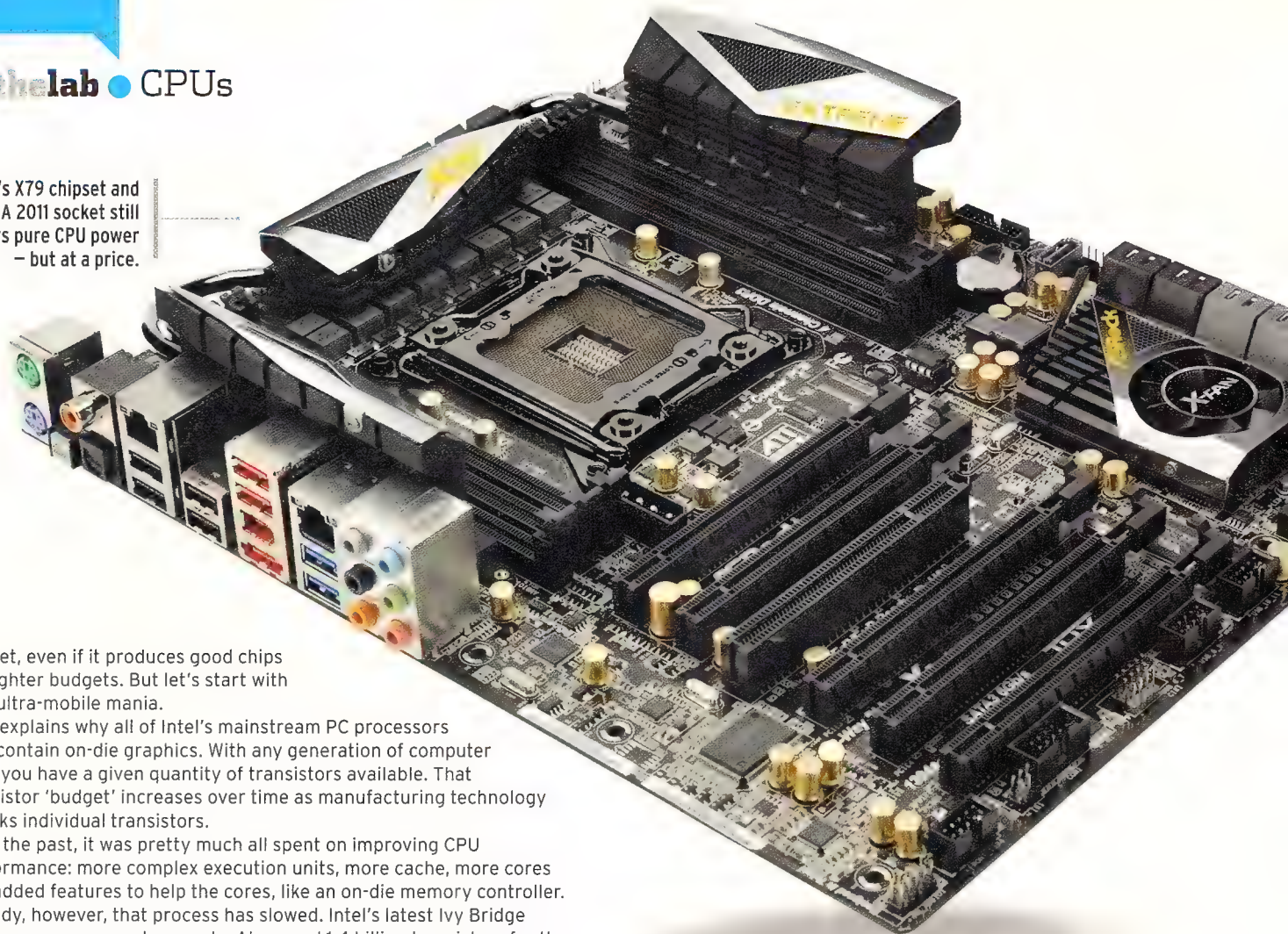
JARGON EXPLAINED

BGA and LGA sockets. Currently, all Intel's desktop chips are LGA or land-grid array. That's a socket type that allows the CPU to be swapped in and out, but it's likely that BGA or ball-grid array sockets will become the norm in the next few years. Problem is, BGA requires the CPU to be soldered into the socket, so that sadly means CPUs and motherboards will eventually have to be bought as a package.



Spare a thought for the poor old desktop PC. Because Intel increasingly doesn't.

Intel's X79 chipset and LGA 2011 socket still offers pure CPU power – but at a price.



market, even if it produces good chips for tighter budgets. But let's start with that ultra-mobile mania.

It explains why all of Intel's mainstream PC processors now contain on-die graphics. With any generation of computer chip, you have a given quantity of transistors available. That transistor 'budget' increases over time as manufacturing technology shrinks individual transistors.

In the past, it was pretty much all spent on improving CPU performance: more complex execution units, more cache, more cores and added features to help the cores, like an on-die memory controller. Already, however, that process has slowed. Intel's latest Ivy Bridge processors are a great example. At around 1.4 billion transistors for the quad-core version, such as a Core i5-3570K, Ivy Bridge is fully 240 million transistors bigger than the Sandy Bridge quad-core chip it replaced, but it doesn't have any additional cores or extra cache. OK, the execution units are slightly tweaked, but we're talking typically low single-digit improvements in per-clock performance. That's not a lot to show for a 20% increase in complexity. The logical explanation, of course, is that Intel chucked almost all those 200-odd million transistors at Ivy Bridge's graphics core.

The same thing will apply later this year when Intel's new Haswell chips arrive. They'll still be four-core beasts at best, and most of the increase in transistors will be used to improve the integrated graphics.

The problem is that, to date, Intel's on-die processor graphics hasn't been gaming-worthy. In a mobile PC context, the power efficiency of integrated graphics is great, but on the desktop and if you're into games, it's dead silicon. Worse than that, it means Intel is compromising processor performance – performance you'll actually use – in favour of improving integrated graphics performance that you likely won't use.

Eventually Intel's processor graphics will come good for gaming, but we're still several years away from that happening. Anyway, all this is because mobile computing is driving CPU design. Actually, that's not entirely the case – it's also because AMD hasn't stepped up to the plate. AMD can't compete with the sheer raw performance of Intel's fastest current four-core chips in the LGA1155 socket. And that means it's nowhere near Intel's high-end chips in the LGA2011 socket.

LGA2011 chips, of course, don't have processor graphics and are entirely focused on CPU performance. But without AMD keeping Intel honest, LGA2011 chips are intentionally hobbled and very expensive. Put it this way: if AMD had a competitive CPU, Intel's six-core LGA2011 CPUs would probably be half the price they are today, and there would also be eight cores on top.

Put it all together and the unavoidable, undeniable conclusion is that Intel's desktop CPUs are already nothing like what they would be if Intel was simply focusing on performance. But what of AMD? Well, that's an entirely different problem. And it's all to do with execution.

Put simply, everything AMD has launched in the past five years has been too late and too slow. That's a great pity because AMD is more

likely to sell straightforward CPUs in the configurations that desktop PC enthusiasts want. Plus, if those CPUs were more competitive, Intel would surely be forced to do things differently, too.

ON THE BRIGHT SIDE

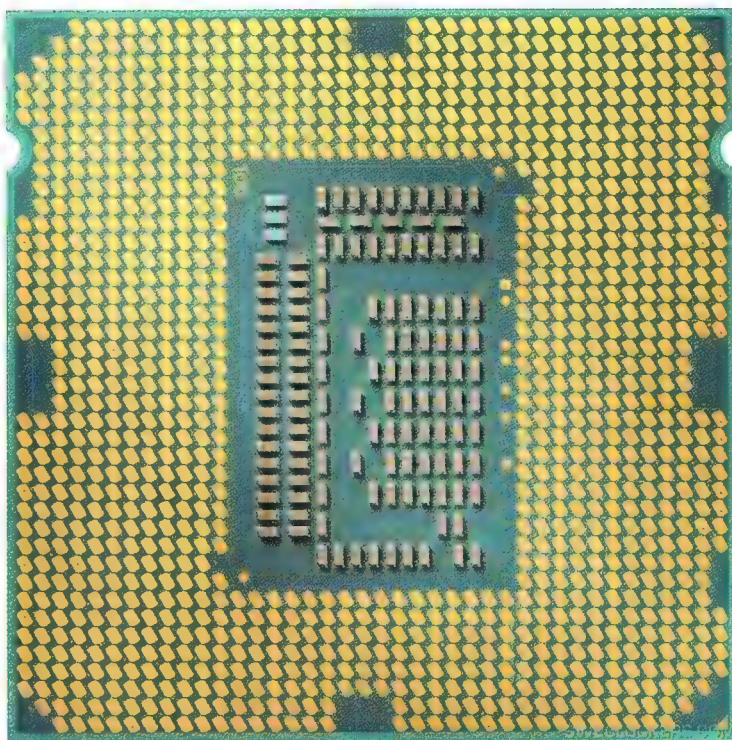
At this stage, we've painted a pretty bleak picture of the state of PC processors. But actually, things are still pretty good. You can still buy CPUs separately and mix and match them with motherboards and GPUs, allowing you to get the performance balance just right. And AMD's chips are still competitive at certain price points, which has a knock-on effect across the market.

More to the point, while it's likely CPU performance would be even higher if AMD had played a better game in recent years, of course today's processors are still extremely effective bits of kit. Intel may not have actually added cores to its mainstream chips, but it has done a very good job of improving per-core performance. Sandy Bridge was a huge step forward in that regard and the latest Ivy Bridge processors raised the game a little further.

All of which means these are still the good times, right now. Five years from now, it's hard to say, but it's extremely likely you'll have a lot less choice, and year-on-year CPU performance increases may have slowed to a trickle – AMD may be a goner, for instance, and it's likely you won't be able to buy a standalone CPU and drop it into your motherboard of choice. A few years after that, you may have to swallow motherboard, CPU and graphics in one big pill.

Back in the here and now though, let's enjoy what's on offer. If you're keen on gaming like us, the good news is that you don't need to go right to the top of Intel's current catalogue to get great performance. Intel's mainstream quads are still outrageously good. For those on tighter budgets, there are some very compelling options too, some of which come from AMD.

If you've got a ton of cash, of course, there are even more options. In fact, we've thrown an Intel Xeon chip into the mix to show both how things might have been at the high end and also how you can get round



Intel's increasing tendency to sandbag.

It's also worth noting that from a PC performance and gaming enthusiast perspective, now is a really great time to buy. The upcoming Haswell chips from Intel are unlikely to bring dramatic increases in CPU performance. On the AMD side, we had hoped to see the company really raise its game this year, but now that's looking unlikely before 2014. So it's fair to say that a decent CPU bought today will still be competitive for several years to come.



Intel's latest Ivy Bridge chips are as much about graphics as CPU performance. And that's a problem.

AMD rewrote its own rule book on GPU make-up.

ARE AMDS DAYS NUMBERED?

AMD's stock price is flagging. It's very nearly at its lowest since 1990. Meanwhile, sales of the new Trinity mobile chip are reportedly pretty poor and sales of its server CPUs are dwindling. Its Radeon graphics chips are doing well enough, but that's a relatively small part of AMD's business. What about revenues from games consoles? They don't ultimately amount to much right now. AMD is still mostly about conventional x86 CPUs.

Of course, the traditional desktop PC sector is in long-term decline. Intel and Nvidia stock is bombing too. But AMD is dependent on traditional PC products, while Nvidia has its Tegra ultra-mobile chip for phones and tablets as a get-out-of-jail card and Intel is big enough to bleed for years before turning terminal and has the resources to diversify in the meantime.

Apparently, AMD has over \$1 billion of cash in the bank, which sounds great, but at current burn rates, it'll probably hit the wall within 18 months. And with doubts over its future and its stock price in the pan, it can't borrow money to invest its way out of trouble. So AMD probably needs a miracle product inside a year. But here's the problem: the Steamroller update to its core CPU design was due this year, but is rumoured to have been delayed until 2014. If that's true, it may arrive too late to save AMD. And that's assuming it delivers the goods on performance, which you'd be brave to bet on.

If there's any good news, it's that AMD looks to have lined up to provide much of the internal hardware for the next Xbox and PlayStation gaming consoles. They're both rumoured to arrive before the end of this year. Whether that lifeline can save AMD's PC processor business is an open question.



i SOCKET FM2
CORES 4
THREADS 4
CLOCK SPEED 3.4GHZ /
4GHZ TURBO

7
10

\$116



i SOCKET AM3
CORES 4
THREADS 4
CLOCK SPEED 3.8GHZ /
4GHZ TURBO

7
10

\$135



AMD A10-5700

A technically interesting CPU.

@ www.amd.com/au

✓ Powerful, top tech.

✗ Unique socket,
frame rate pain.

This is a chip we're desperate to like. For starters, it's the most technically interesting CPU here. You've got AMD's latest Piledriver architecture and all its funky hybrid core technology. Then there's an AMD Radeon HD 7660D graphics chip, the most powerful integrated core on Earth.

In the end however, it's cold, hard numbers and practicality that counts, not intellectual niceties. On the latter point, the A10 falls at the first hurdle. Thanks to that integrated graphics core, it has different pin-out requirements to other AMD chips. And that means a unique socket, known as FM2. That's a bit of a bummer because it means you can't buy an A10-based system and retain the option of upgrading to heftier hardware later on. And trust us, pretty soon you'll want heftier hardware. In multithreaded benchmarks like video encoding and pro rendering, the A10-5700 is pretty close to the AMD FX-4300 to the right, as you might expect – they both have four AMD Piledriver spec cores and clock speeds that aren't a million miles apart.

In games, however, the A10's missing L3 cache causes some frame rate pain. To put all that into context, the FX-4300 achieves over 70fps on average in our *World in Conflict* test, while the A10-5700 slips under 60fps, probably thanks to the lack of L3 cache memory. What's more, whip out our GeForce GTX 680 test GPU and run on the integrated Radeon HD 7660D graphics and that plummets to just 14fps. There is the prospect of using Hybrid Crossfire to pair the integrated GPU with a cheap graphics card. But it's all a bit complicated for what is, in the end, a platform with limited upgrade options.

AMD FX-4300

High-priced giant killer.

@ www.amd.com/au

✓ Equal to siblings, good
for gaming.

✗ Hefty price, two
cores under par.

There's nothing we love more than a giant-killing budget special. So, the AMD FX-4300 ought to be right up APC's collective alley with its reasonable price tag. But the problems are just beginning when you look at the price. The gap to the FX-6300 is a little bigger in AMD's own price lists. But in the end, what matters to us (and, obviously, to you) is full retail pricing. And as we go to press, the 4300 just happens to be \$10 cheaper than the 6300.

If the 4300 was just clocked a little slower or short on cache, that might actually make sense. You could clock it up and spend that tenner down at the pub. In reality, however, the 4300 is missing a pair of cores and that really is awfully hard to make up for.

In the 4300's defence, it actually compares pretty well with its AMD siblings when it comes to games. For starters, at 3.8GHz base and 4GHz turbo, it's got some decent clocks. Things look even more wonderful when you dig into the unlocked multiplier.

If our testing is anything to go by, you can get very close to 5GHz with this chip. At that speed, it makes light work of most games and cancels out any stock-clocked advantage held by Intel's non-overclockable Core i3-3225, which isn't bad for the price. Of course, the 6300 isn't far behind in the overclocking stakes.

All of which means the AMD FX-4300 only really makes sense in isolation. As soon as you compare it to the competition – and the 6300 in particular – there's no denying that the value proposition simply implodes. The 6300 is preferable.



57
SERIES

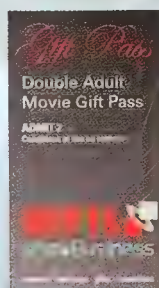
A new dimension in entertainment with award-winning design and exceptional IPS display technology.

27

D2757PH

1920 x 1080 • 250 cd/m² • 2 x HDMI + VGA • Speakers

- Flicker-Free 3D (Polarized Glasses)
- 2D to 3D Simulation Mode
- Superior IPS Display Panel
- Thin Bezel at Top and Sides
- Rear-Facing Connectors



Double Movie Gift Pass with every AOC D2757PH Purchased by 31 March 2013



i SOCKET AM3
CORES 6
THREADS 6
CLOCK SPEED 3.5GHZ / 4.1GHZ

\$145

**8
10**



AMD FX-6300

You wouldn't go wrong with this one.

@ www.amd.com/au

✓ Gaming ace, balanced performance.

✗ A little slow.

Picking between the AMD FX family is mostly about making finely balanced judgements on performance and price. Well, it is when you compare this six-core FX-6300 with the eight-core 8350. As enthusiasts will already appreciate, the quad-core 4300 pretty much implodes by virtue of being far too close to the AMD FX-6300 on pricing.

So, in AMD terms, it's 6300 versus 8350. Time for a fight. For gaming, it's a knockout in the first round. After much gameplay, we can confirm that the 8350's extra cores don't land any punches, so the extra cost is hard-earned money much better invested in a faster graphics card.

Shift the attention to thread-heavy software, however, and we're looking at a split points decision. On the one hand, there's no doubting that the 8350 is notably quicker. But it's not 50% quicker, so the value proposition isn't linear. We'd still probably take the 8350, simply because the price difference isn't a huge amount in the context of building a full rig. But it's a very marginal call and objectively you wouldn't be wrong to go with the 6300.

As for the comparison with Intel chips, it's a little more straightforward. In games, the 6300 has barely left its corner before the Core i3-3225 has it out cold on the canvas. But in threaded apps, it's the 6300 that flattens the Intel chip early in the first round.

However, it's the AMD chip that's a little more balanced. You get decent frame rates in games. That's especially true if you overclock – something you can't do with the Intel chip, and you get much better multithreading throughout. Overall it's a pretty nice package.

i SOCKET AM3
CORES 8
THREADS 8
CLOCK SPEED 4.0GHZ / 4.2GHZ TURBO

\$195

**8
10**



AMD FX-8350

A very sweet deal.

@ www.amd.com/au

✓ Clock speeds good, price is right.

✗ Not quite enough, flags out on tests.

Per-core performance. Single-threaded grunt. Instructions per clock. Call it what you will, but the amount of work done by a single core each cycle is AMD's big problem right now.

Of course, defining what a core is has become a little murky since AMD released the Bulldozer architecture in late 2011. With shared floating point resources for each pair of integer units, you can argue this chip is both quad-core and eight-core. In reality, it's somewhere in between.

Like the other AMD FX chips, the 8350 has the new-spec Piledriver cores. But they're only a fairly minor derivation of Bulldozer, so AMD's best hope with this generation was always going to be clock speeds.

And it's done a pretty good job on that note. The 8350 is clocked at 4GHz minimum with an extra 200MHz in Turbo mode. So it's got a base clock quicker than anything Intel can muster. And yet it's still not enough.

Perhaps the most damning evidence of this is that this mighty eight-core chip is actually beaten in our usual *World in Conflict* game benchmark by the piffling dual-core Intel Core i3-3225. For games, per-core performance still matters.

On the other hand, you could argue that the 8350's 74fps average and 26fps minimum is good enough. If that's how you feel, consider that the 8350 is competitive with the much more expensive Intel Core i7-3770K in threaded software like video encoding.

Suddenly, an 8350 for about \$195 looks like a very sweet deal if you're mainly coding video and then playing a few games on the side. But that's the thing about AMD chips. They need qualification.



SOCKET LGA1155

CORES 2

THREADS 4

CLOCK SPEED
3.3GHZ

\$135

**6
10**



SOCKET LGA1155

CORES 4

THREADS 4

CLOCK SPEED 3.2GHZ /
3.6GHZ TURBO

\$199

**8
10**



Intel Core i3-3225

The AMD alternatives are better.



www.intel.com.au



Half-decent gaming chip, Ivy Bridge.



No Turbo, multiplier locked.

Once upon a time, during one of the golden ages of homebrew computing, the difference between a high-end CPU and a poverty chip was nothing that you couldn't fix with a big fan, some thermal paste and maybe a pencil.

If you want to know just how much things have changed, look no further than the Intel Core i3-3225. The poverty stricken bit it's got nailed, even if \$135 isn't exactly chump change.

But the sad fact is that there's nothing you can do to bridge the gap between the 3225 and even a mid-range chip like the Core i5-3570K, much less a six-core Extreme processor or the outrageously priced Xeon monster.

Partly that's because the 3225 has just two cores. OK, so they're Hyper-Threaded so you've got four threads. But Hyper-Threading is no substitute for corporeal cores in the silicon. If that wasn't unfortunate enough, not only does the Core i3-3225 lack Intel's Turbo feature – it's also multiplier locked. So you're limited to a few MHz boosts on the base clock, which is to say bugger all, and the 3225 is as the 3225 does. Giant-killing antics aren't in its make-up.

That's not actually to say it's completely without merit. It's a half-decent gaming chip thanks to the epic single-threaded grunt of the Intel Ivy Bridge architecture. So for gaming alone, it's probably a better pick than most and possibly all of the AMD alternatives.

But as an all-rounder, the Core i3-3225 is frankly pretty pants. More to the point, it's only marginally cheaper than the Core i5-3470, which is a chip with serious gaming chops and solid threading throughout. All of which mean you really shouldn't bother.

Intel Core i5-3470

Serious gaming chops; solid threading.



www.intel.com.au



Compelling, good for non-OCers.



Not for overclocking.

The Intel Core i5-3470 is a pain in the ass. In many ways, it's a very compelling chip that offers nearly everything you get with the Core i5-3570K for a little less cash. So it puts you in a real quandary. Should you spend \$199 on the 3470, or should you pony up \$249 for the 3570K?

For some the answer is actually pretty easy. If you're absolutely sure you're not going to overclock your CPU, go for the 3470. The stock clock comparison is 3.2GHz nominal and 3.6GHz Turbo for the 3470 and 3.5GHz nominal, 3.8GHz Turbo for the 3570K.

In either case, you get quite fabulous single-threaded performance, very good multithreaded throughput and gaming that's about as good as it gets. In fact, in the here and now, it's all you need for quality gaming.

But the reality is that you don't just buy CPUs for a day, you buy them for the long run. And there's nothing like a bit of overclocking to keep a CPU in the game for a little longer. That's when the 3570K beats the 3470 with a large, nail-studded stick.

Irritatingly, that's not because there's anything squiffy about the 3470's silicon. It's because Intel doesn't give you full access to the CPU multiplier. You can bump up the base clock a little to compensate, but we're talking about a few extra percentage points.

At the end of the day, the 3470K will go to a little over 4GHz on plain old air cooling. But the 3570K is excellent for very nearly 5GHz. A couple of years from now, when some coding monkey-boffin hybrid comes up with something clever and impossibly fun but unusually CPU-intensive to play, that could make all the difference.

i SOCKET LGA1155
CORES 4
THREADS 4
CLOCK SPEED 3.4GHZ /
3.8GHZ TURBO

\$249



Intel Core i5-3570K

It's a done deal.

@ www.intel.com.au

✓ Quad-core, good gaming choice.

✗ No Hyper-Threading.

The marketing men of Intel don't half wind us up. But there is one upside to the endless artificial variants on Intel's Ivy Bridge micro-architecture theme: there's bound to be something that fits into just about any usage model slot you can think of.

When it comes to gaming, that something is undoubtedly the Core i5-3570K. It's the full quad-core Monty, none of this dual-core, quad-thread nonsense served up by cheaper Core i3s and indeed one or two Core i5 models.

What it doesn't have is Hyper-Threading, so it's not the sharpest tool in the box when it comes to heavily threaded apps like video encoding. To put that in context, it's no slouch. Indeed, it's quicker than a six-thread AMD FX processor in Cinebench and x264 HD video encoding. But it's Core i7s with eight threads that you want for the best parallelism on the LGA1155 socket. Actually, for parallelism on the cheap, look for the AMD FX-8350.

Instead, you get the 3570K for games. Multithreading support has improved dramatically in the games industry, but we're not at the point where the Core i7's extra four threads deliver anything like double the performance. Then factor in the 3570K's healthy stock clock speed of 3.5GHz, its unlocked multiplier, its overclocking headroom, its monster single-threaded performance and its relatively tolerable price and you get the idea. It's a done deal.

Put another way, there's really very little point in spending more than the \$249 needed for a 3570K if gaming is your main priority. There are a few marginally faster chips, but the difference isn't big enough in-game that you'd actually feel it.

i SOCKET LGA1155
CORES 4
THREADS 8
CLOCK SPEED 3.5GHZ,
3.9GHZ TURBO

\$360

Intel Core i7-3770K

Horrifically good.

@ www.intel.com.au

✓ Hyper-Threading, unlocked multiplier.

✗ Licky price.

There are some things in life you really want to hate. Like massively successful people. Or new variants of the Porsche 911 with electric steering (sorry, that one will probably take a bit too much explaining). But then they turn out to be really nice and amazing fun to drive. And you just bloody well can't.

That's pretty much the case for the Intel Core i7-3770K. At around \$360, it costs over \$160 more than the i5-3470. But it's based on precisely the same silicon. The main difference is that Intel has flicked a few switches, fully exposing the Ivy Bridge architecture's goodness.

So, you get Hyper-Threading and thus a grand total of eight threads. The CPU multiplier has been fully unlocked too, so you can clock the twangers off it at whim. And the cache has been fully enabled, so you've got the full 8MB.

It's clocked a bit higher than the 3470, too. Thus the 3770K is what the Ivy Bridge always ought to have been, it's just annoying to have to pay so much for it when you know all those gadgety extras are hiding inside a 3470.

But all that said, the 3770K is such a horrifically good chip, it's impossible for us to really hate. It manages to rip through highly threaded software, such as video encoding, faster than a rat up a drainpipe.

Perhaps contrary to expectations, it's horribly quick in-game as well. We've had one or two problems with previous generations of Hyper-Thread enabled chips and thread management, but that's no longer the case. All of which means there's just one thing preventing the 3770K being the obvious pick: and that's the price.

apc



On sale now
for only \$5.49



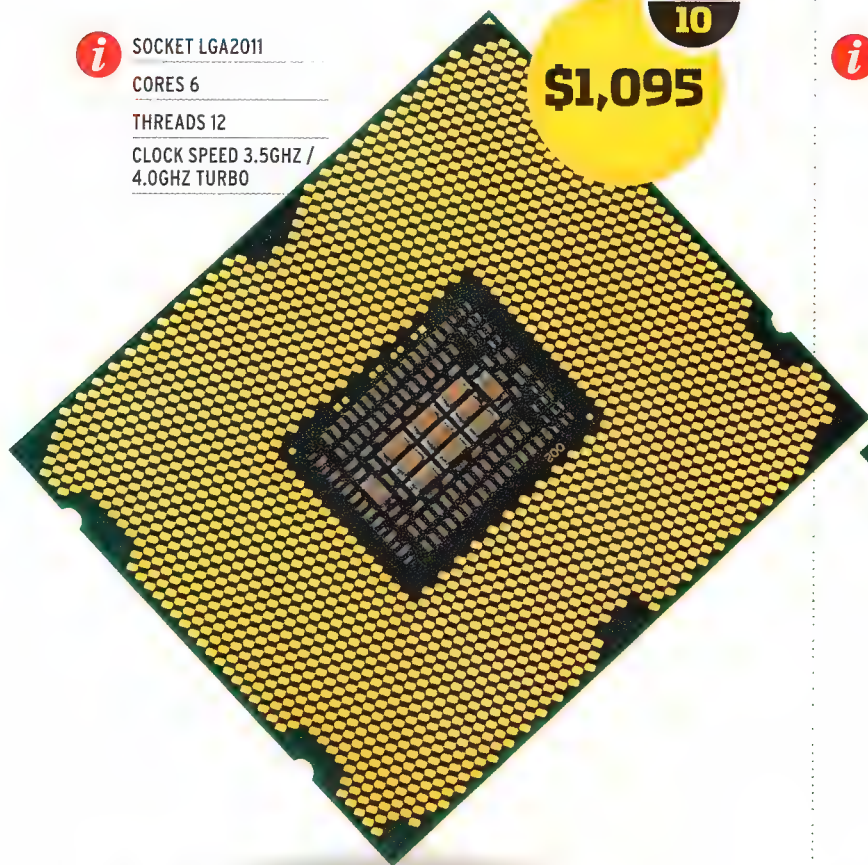
Available on the
App Store

iPad is a trademark of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

i SOCKET LGA2011
CORES 6
THREADS 12
CLOCK SPEED 3.5GHZ /
4.0GHZ TURBO

\$1,095

**7
10**



Intel Core i7-3970X

Something's wrong.

@ www.intel.com.au

✓ Hell of a CPU, six cores.

✗ Two cores
locked out.

High-end CPUs used to be a tough sell back when Intel produced a single processor core and simply differentiated with clocks and cache. There wasn't much you could do about the latter, but overclocking a budget chip usually produced something surprisingly comparable with the flagship Extreme effort.

Then Intel started doing things differently, like the six-core Gulftown chip. With an extra pair of cores and a unique triple-channel platform, it was a different proposition from Intel's mainstream desktop CPUs. Intel's high-end platforms have been thinly disguised workstation-cum-server tech – that's added complexity and cost in areas that don't benefit desktop users. And yet, you could still argue that they're something special.

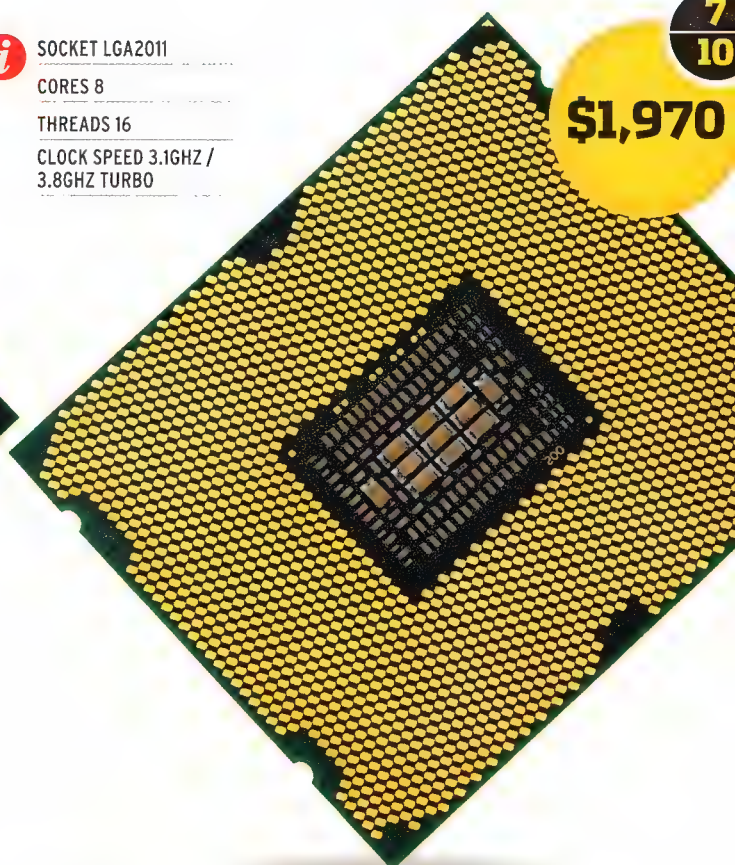
All of that absolutely applies to the Intel Core i7-3970X. It slips into the LGA 2011 socket and its crazy quad-channel memory interface. It's got more cores than any chip from the LGA 1155 family. But it's a chip we're fundamentally not happy with. The reason is the two hidden cores inside the processor die. Intel makes the argument that they're locked out to allow the chip to run at higher clocks, but if you compare the clock speeds, it's not terribly convincing.

The 3970X is still a better bet than the Xeon due to the latter's locked CPU multiplier and ridiculous price. Make no mistake, this is one hell of a CPU, even with two cores fused off at the factory. But if we were doing LGA 2011, it would be the 3930K we'd pick. It's got six cores, it's unlocked, and it's half the price.

i SOCKET LGA2011
CORES 8
THREADS 16
CLOCK SPEED 3.1GHZ /
3.8GHZ TURBO

\$1,970

**7
10**



Intel Xeon E5-2687W

Executive spending.

@ www.intel.com.au

✓ Power chip, good
for video editing.

✗ Mega-pricey,
can't OC.

Eight cores. 16 threads. This is the way Intel's Sandy Bridge-E was supposed to be. But it's only available in Xeon trim.

You could ask what's in a name? After all, the Intel Xeon E5-2687W will drop into any old X79 motherboard, just like a Core i7 desktop processor. So if you want the full eight cores, you can have them. But that Xeon moniker comes with a pretty punitive price tag. In this case, we're talking around \$1,970. If that seems ridiculous, it probably is. However, in Intel's defence, Xeons are aimed at a different market.

In the desktop context, that means you're paying for redundant features, most notably validation for enterprise workloads. The other unwanted corollary of the Xeon's workstation-ness is that it's irreversibly locked, so you can't adjust the CPU multiplier. Now that Intel has tied all sorts of functionality to the base clock, that means you really can't overclock at all. We couldn't even get a few per cent out of the base clock. Whether this particular setup has architectural benefits or merely reflects Intel's desire to prevent unauthorised overclocking is moot now. It's how Intel plays the game. There's no getting round it.

That means that while the Xeon has the six-core Core i7-3970X spanked at stock clocks, you can wind the 3970X up and close the gap. In that scenario, the six-core chip will provide a pretty similar multithreaded experience, but hammer the Xeon in single-threaded metrics. If you're risk averse and crunch a lot of video, the Xeon makes sense. For everyone else, the Core i7 is more cost effective.

Benchmark analysis

It's all about the numbers.

Picking some of our benchmarks is easy enough. The x264 HD test is a great guide to video encode performance. It's straight in. Cinebench gives a glimpse of how CPUs perform in professional applications which major on threading. Stick that on the list. Memory bandwidth is interesting in terms of the insight it gives to platform scalability and, therefore makes the grade. Then there's power consumption, which will split opinion in terms of its relevance on the desktop. At the very least, it reveals the underlying efficiency of CPU architecture.

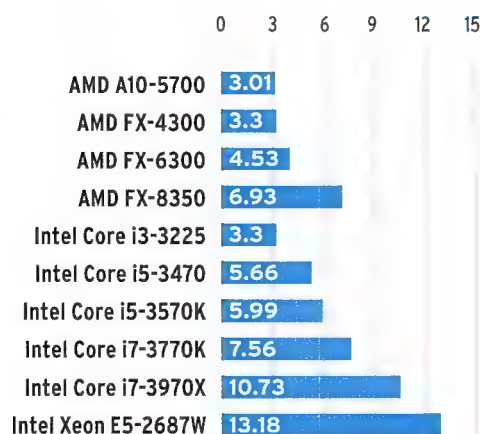
Of course, we're big fans of overclocking so that's a critical

benchmark. All of which just leaves the matter of gaming. With so many game titles out there, what do you go with?

Well, *World in Conflict* has several things going for it. It scales well with CPU performance, for starters. Just as important, it's got a thing for single-threaded grunt. That's not to say extra cores have no impact. But you need beefy cores to get the best from it. Given that several of the other benchmarks we use give a good guide to multithreading performance, *World in Conflict* provides that critical worst-case scenario in terms of games that need strong per-core performance.

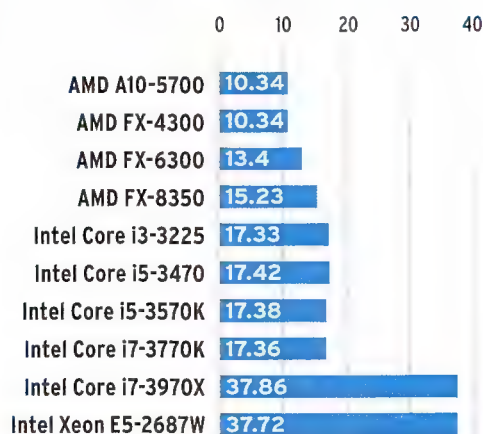
CPU RENDERING PERFORMANCE

Cinebench 11.5
(Index/higher is better)



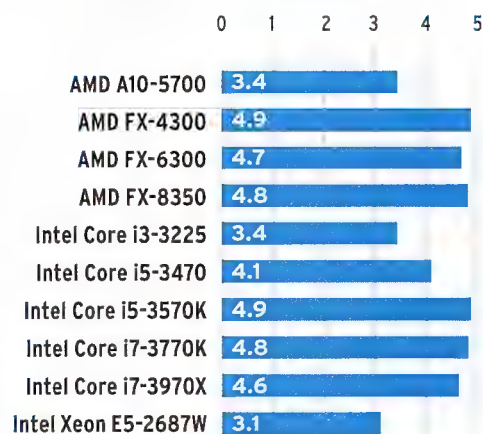
CPU MEMORY BANDWIDTH PERFORMANCE

SiSoft Sandra
(GB/s/higher is better)



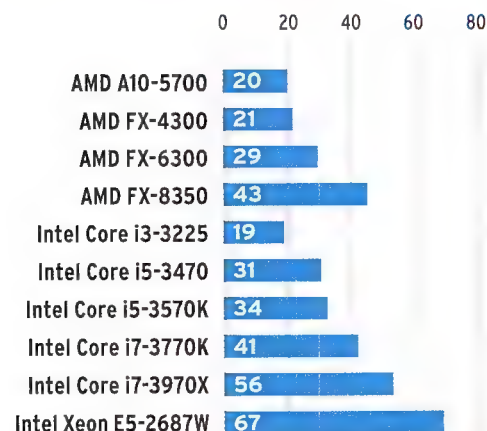
CPU OVERCLOCKING PERFORMANCE

Maximum frequency
(GHz/higher is better)



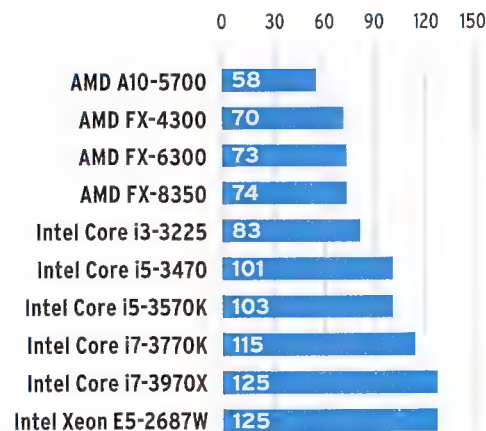
CPU VIDEO ENCODING PERFORMANCE

x264 v4.0
(fps/higher is better)



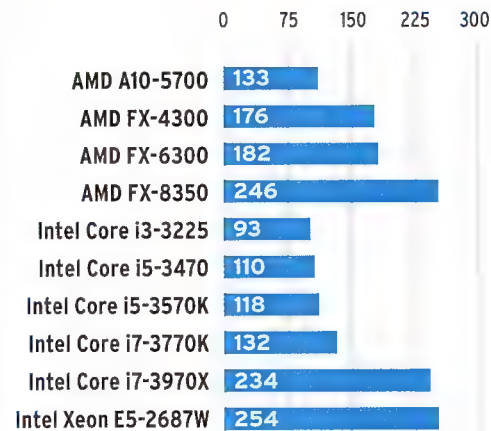
CPU GAMING PERFORMANCE

World in Conflict
(fps/higher is better)



POWER CONSUMPTION PERFORMANCE

Overall platform
(Watts/lower is better)



AND THE
WINNER
IS...

Intel Core i5-3570K

The computer industry has become obsessed with ultra-mobile. Eventually that's going to do horrible things to the desktop PC. It's already putting a cap on desktop CPU performance. The good news is that the worst has yet to come. Today's CPUs still offer almost all of what we really care about. There's configurability in terms of sockets, there's overclockability from all of AMD's chips and some of Intel's, and there's no shortage of choice.

This month we have chips ranging from two cores all the way up to eight cores, 16 threads and high on \$1,970. We're still in the golden age of desktop computing, even if it is the dying days. The joker in this pack is AMD's A10 Fusion chip. It sits alone in this test by virtue of a unique CPU socket that's a function of its integrated graphics.

That makes it a very different proposition from a chip that can drop into any old AM3 motherboard and that takes it out of the running. It's an interesting chip for media centre larks. But it's not a serious player in the mainstream desktop game. As for the rest, the AMD FX-4300 is first up against the wall. That's not because it's a particularly bad processor. It's just not cheap enough in comparison to the others. We're not crazy about the Intel Core i3-3225, either. It's quite pricey for a dual-core and you can't overclock it, which is a major downer.

Then there are the two big-iron chips on the LGA 2011 socket from Intel: the Core i7-3970X and Xeon E5-2687W. They're both

absolute beasts. And they're both silly money, unfortunately.

If you've money to burn, fair enough, they're spectacular performers. From here on in, it's very tight indeed.

In fact, of the remaining processors you can make a convincing argument for every single one being our overall winner. The Intel Core i7-3770K, for instance, is a monster. It's insanely quick for a quad-core chip. And you can have that performance on the sensible LGA 1155.

But if you're a bit game-obsessed like we are, it's hard to justify the \$360 price tag. It simply won't deliver more tangible in-game performance than either of the Core i5 chips. So it's goodbye to the 3770K.

Next up is a three-way tie for second place between the AMD FX-6300, the FX-8350 and the Intel Core i5-3470. Depending on your budget and what you like to do with your system, any of these three could be your perfect processor partner. As always, we lean towards game performance, so the Core i5 gets our vote.

All of which leaves the Intel Core i5-3570K with the spoils of victory. Yup, it's a tediously predictable result. And not one we can justify in objective terms. We know that \$50 is a lot to pay for what amounts to an unlocked CPU multiplier. We wish Intel didn't do things that way. But it does, we want that extra control and we're willing to pay for it. **APC**

CPU SPECIFICATIONS

	Price	Web	Socket	Cores	Threads	Clock speed	Cache	Memory	Process	TDP
AMD A10-5700	\$116	www.amd.com/au	FM2	4	4	3.4GHz/4GHz Turbo	4MB	DDR3, dual-channel	32nm	65W
AMD FX-4300	\$135	www.amd.com/au	AM3	4	4	3.8GHz/4GHz Turbo	4MB	DDR3, dual-channel	32nm	95W
AMD FX-6300	\$145	www.amd.com/au	AM3	6	6	3.5GHz /4.1GHz Turbo	6MB	DDR3, dual-channel	32nm	95W
AMD FX-8350	\$195	www.amd.com/au	AM3	8	8	4GHz /4.2GHz Turbo	8MB	DDR3, dual-channel	32nm	125W
Intel Core i3-3225	\$135	www.intel.com.au	LGA 1155	2	4	3.3GHz	3MB	DDR3, dual-channel	22nm	55W
Intel Core i5-3470	\$199	www.intel.com.au	LGA 1155	4	4	3.2GHz/3.6GHz Turbo	6MB	DDR3, dual-channel	22nm	77W
Intel Core i5-3570K	\$249	www.intel.com.au	LGA 1155	4	4	3.4GHz/3.8GHz Turbo	6MB	DDR3, dual-channel	22nm	77W
Intel Core i7-3770K	\$360	www.intel.com.au	LGA 1155	4	8	3.5GHz/3.9GHz Turbo	8MB	DDR3, dual-channel	22nm	77W
Intel Core i7-3970X	\$1,095	www.intel.com.au	LGA 2011	6	12	3.5GHz/4GHz Turbo	15MB	DDR3, quad-channel	32nm	150W
Intel Xeon E5-2687W	\$1,970	www.intel.com.au	LGA 2011	8	16	3.1GHz/3.8GHz Turbo	20MB	DDR3, quad-channel	32nm	150W

The car you want is now easier to find.



GET CRAZY FAST HOME WI-FI

Wireless networking has just received a major shot in the arm. **Nathan Taylor** reveals everything you need to know to upgrade.

Moore's Law is not something that just applies to processors. Hand in hand with the evolution of the CPU, networking has made leaps and bounds in the past 15 years. While optical networking in particular has come along in incredible leaps, wireless networking has also made huge strides. After all, it was only 14 years ago that the 11 megabits per second (Mbps) 802.11b wireless was introduced. The current best gear works at close to 130 times that speed.

Those new devices, operating at 1.3 gigabits per second (Gbps), started being released towards the end of 2012, and there are many more scheduled for this year. What's more, we may be seeing even faster speeds coming very soon.

Wired networking too, is going through an evolution. Gigabit Ethernet has been around for quite a few years now, but it's only in the last few that it's gone from being exotic to standard. That's being driven in part by the National Broadband Network, which virtually mandates that you have a home wired for Gigabit speeds, since your old 100Mbps Fast Ethernet network isn't good enough to handle it.

This month, we'll take a look at your options for upgrading your network now, and walk you through some of the steps to take to set it up and optimise it for performance.

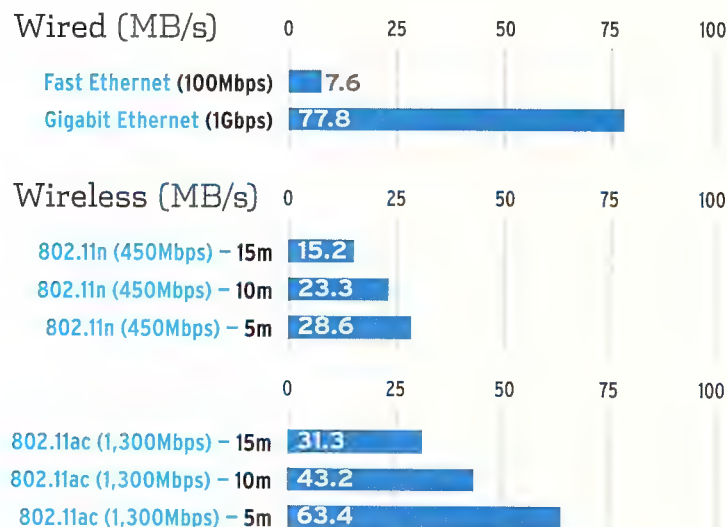
SPEEDS TODAY

As of right now, the best-in-class speed for wireless networking in the home is 1.3Gbps from 802.11ac wireless networking. For wired networking, it's 1Gbps Gigabit Ethernet.

Of course, theoretical speeds can be deceiving. After all, you'll never, ever get even close to the theoretical speeds of wireless. And wired networking, while much more efficient than wireless, is still far from 100%. To that end, we decided to run some real-world tests to give you an idea of the differences in performance from some of the common

networking systems in use today. These are simple file transfer tests, from a RAMDisk on one PC to another, of a 2GB file.

For the wired tests we used a 5m Cat 6 cable, first on a 100Mbps Fast Ethernet switch built into an iiNet BoB router, then on a 1Gbps switch, the Linksys SE2500. For wireless, we ran tests at 5, 10 and 15m between a Cisco Linksys EA6500 and a Linksys WUMC710 client station on both 450Mbps 802.11n and 1.3Gbps 802.11ac. These are the transfer speeds we achieved, in megabytes per second (MB/s):





For now, 10Gbps Ethernet switches tend to look like this, but eventually they'll make it into something that you'll put in your home.

WHAT'S COMING DOWN THE PIPE?

It's a dilemma as old as computing: If I buy today, will I be screwed in six months' time when a new version is released?

There is some validity to that concern, but it should not stop you from upgrading now, and it will probably be longer than six months. There are new technologies coming, but we likely won't see products until 2014, and even then an 802.11ac or gigabit network will still serve you very well, and be more than capable of handling the NBN for a few years yet. Still, if you like thinking long term, there are some new technologies in the works.

- The 802.11ac specification technically supports speeds up to and beyond 7Gbps. Just as we saw with 802.11n, which began with 150Mbps and went to 300 then 450Mbps, we may see future 802.11ac products with higher speeds.
- A new 802.11ad specification is in the process of ratification. This cranks up speeds yet again (we'll talk about it more later in the article).
- 10 gigabit Ethernet switches have been in use in businesses since 2007, and it's inevitable that they'll eventually reach bandwidth-hungry consumers. There is also a 40Gbps standard, but that might take a little longer.

Looking at those, you can quickly see that if you're on one of the slower networks, it's most definitely worth the upgrade. Upgrading from a router or switch with Fast Ethernet to one with Gigabit is a no-brainer.

CHOOSING YOUR 802.11AC GEAR

Upgrading to the new 802.11ac wireless will likely double your current 802.11n performance – even more so if you're on one of the older 802.11n standards (like 300Mbps and 150Mbps) or 54Mbps 802.11g.

So, you're not messing around and want to jump straight to the

best wireless network available right now? Yes, you're prepared to face the early adopter's fee in exchange for knowing that your wireless network will be viable for years to come. It'll offer super-fast local file transfers and won't prove to be a bottleneck to super high-def video transmissions from the NBN.

If that's the case, getting the right 802.11ac will be crucial for the long term viability of your network. There are definitely some things you should look for in both the router and adapters. Here, we explain what to look for in an 802.11ac router and adapter.

Five things to look for in an 802.11ac router

1 1,300Mbps speeds. 1.3Gbps is the current top speed for 802.11ac routers. When the spec was launched last year, some of the initial units came out only supporting 867Mbps, meaning they had just two spatial streams instead of three (each spatial stream adds 433Mbps). We might still see some 867Mbps routers appear, the same way we still see 300Mbps 802.11n routers, but we figure if you're going to go all out and set up an 802.11ac network, you may as well enjoy the best it has to offer. As an aside, in some cases you may see routers advertising a 1,750Mbps transfer rate. Don't be fooled by these. It's a bit of marketing legerdemain, where vendors take a dual-band router and add the bandwidth of both bands together, even though a given wireless station can only use one band at a time. What 1,750Mbps really means here is 1,300Mbps for 802.11ac in the 5GHz band, and 450Mbps in the 2.4GHz band for 802.11n.

2 A Gigabit WAN port. You may still be on ADSL right now, but in the future you're likely to be moving to the NBN. The NBN requires an Ethernet port for connectivity. That WAN port has to be Gigabit to support NBN speeds. Fortunately, an increasing number of routers support ADSL now and have an additional Ethernet WAN port, making them NBN-ready. Some other

routers may allow you to reconfigure one of the LAN ports as a WAN port. That's less desirable (since you effectively lose a LAN port), but it will get the job done.

3 Dual-band support for 450Mbps 802.11n. Let's face it: most of your wireless gear won't support 802.11ac for some time. Your tablets, laptops, mobile phones and Wi-Fi capable cameras will still be 802.11n for months or years from now. Fortunately, every 802.11ac router released so far supports dual band and is backwards compatible with Wireless N. If you're going to have to support Wireless N for your 'legacy' devices, you may as well support the fastest form of it, and that's 450Mbps.



The back of Netgear's D6300 modem router. You'll notice there is both an ADSL port and an Ethernet Internet WAN port, so it's ready when the NBN comes along.

4 A vendor that can supply both adapters and routers. At the time of writing, 802.11ac was still a draft standard. It's possible that some vendor incompatibilities will linger until everybody can patch their devices to be fully interoperable. Until that happens, there may be some issues getting products from different vendors to work together. When we tested the first batch of 802.11ac routers a few months ago, we had some problems getting devices from different vendors to interoperate smoothly. Some talked just fine, but others were unusually

slow or couldn't 'see' the wireless network. We'd recommend a one-vendor solution for now, so you can be sure everything works.

- 5 **Something you won't hate being visible in your home.** As we'll explain in a little bit, if you want the best speeds you're going to have to put the router somewhere with an unobstructed line of transmission to your wireless gear. We're guessing if you want 802.11ac, you also want the best speeds, and that will mean putting the router somewhere where people wandering around your house might see it.

Five things to look for in an 802.11ac adapter

So you have your shiny new 802.11ac router. Now it's time to update your wireless gear to support the new standard. The best way to do that is through an adapter, which for now are few and far between, though more are sure to come.

- 1 **Support for 1,300Mbps.** Your router runs at 1.3Gbps, so you want your adapter to as well. This can be tricky. We've yet to see 1,300Mbps USB adapters for example (the current ones work at 867Mbps), but there are bridges and PCIe adapters that work at the top speed. In some cases then, you might have to settle for something slower, but if you can find a way, go with 1,300Mbps.
- 2 **Positioning options.** For the best reception, you want to be able to position the adapter away from the laptop or electronic equipment it's attached to, and you want to be able to angle and lift it. A thumb drive designed to stick out of the side of your laptop can't do that, but a USB device with a stand and extension cable can.
- 3 **USB 3.0 ports.** Unaccountably, the first USB 802.11ac adapters only offered USB 2.0 ports for connecting and sharing drives. We say unaccountably, because USB 2.0 is not fast enough to support the full speeds of 802.11ac transmission. Even the minimum spec of Wireless AC runs at 867Mbps; USB 2.0 runs at a maximum of 480Mbps. At very close range, that means that USB 2.0 has the chance to bottleneck your wireless performance.
- 4 **Bridging to multiple devices.** If you're going with 802.11ac and plan to use it to link fixed position devices like gaming consoles and TV sets, why not look to a bridge, rather than a USB solution. A bridge takes data off the airwaves and puts them on a wired link and vice versa. Bridges like the Linksys WUMC710 allow you to actually hook multiple wired devices into your new 801.11ac wireless network.
- 5 **Fast, dual-band Wireless N support.** You probably won't always be using the device on your own wireless network. You still want it to have fast wireless support for when you're away from home, since that's what most other networks will be using for a year or so.



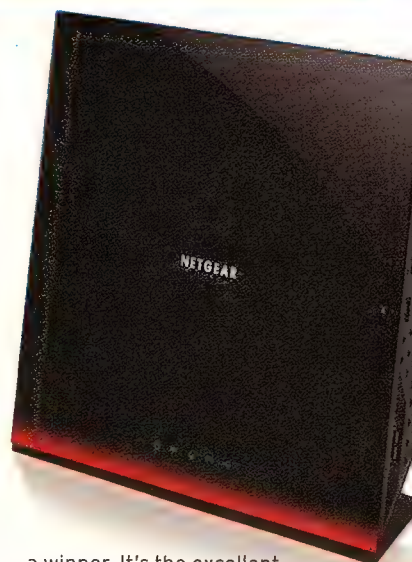
Like most other early USB 802.11ac adapters, the D-Link DWA-182 only supports USB 2.0.

APC picks: THE BEST 802.11AC ROUTER

Netgear D6300 Modem Router

@ www.netgear.com.au \$ \$399

Netgear's D6300 has everything we could ask for in a performance router. For a start, it's one of the very few with a built-in ADSL modem, but it also has an Ethernet WAN port, so it's good for today's and tomorrow's broadband. It's fast too, putting in very good file copy test results across 802.11ac wireless. At 5m, it transferred data at 60.2MB/s when we tested it, and it remained steady at greater ranges, with transfer rates at 40.5 and 27.8MB/s respectively at 10m and 15m. All of its wired ports are Gigabit, so it's a solid performer there, too. But it's not just the networking that makes the D6300



a winner. It's the excellent firmware, a consumer-friendly setup and some of the best file-sharing and remote-access tools we've seen in a consumer router. You can plug a hard drive or printer into one of its two USB ports and share them very easily. Its DLNA implementation for media sharing is particularly excellent.

APC picks: THE BEST 802.11AC ADAPTER

Cisco Linksys WUMC710

@ home.cisco.com/en-apac/home \$ \$200

The best adapter for 802.11ac isn't really an adapter at all; it's a bridge. The WUMC710 allows you to hook-up up to four wired devices to your new 802.11ac wireless network. You first configure the WUMC710 to talk to your wireless network – a relatively painless process involving logging onto its admin page and choosing a wireless network to attach to. Then you plug up to four wired devices into its Gigabit LAN ports via Ethernet cables. These devices are automatically bridged onto the wireless network. It's fast too, easily lapping the performance of the 802.11n adapter built into our



test notebook. On a 1.3Gbps 802.11ac network it hit speeds in excess of 63MB/s at short range; and even on an 802.11n network it achieved 23.3MB/s at 10m.

NEXT-GEN ON A BUDGET

If 802.11ac's too rich for you, you can still build a great 802.11n network for next to nix. Here's how.

You've looked at a few 802.11ac products and the sticker shock has given you whiplash. Still, you'd like to build a solid wireless network for your home. The truth is that 802.11n is still more than viable for most home users. It's fast enough to transmit HD video in real time, and you won't even notice the difference between n and ac when web browsing or playing online games. The only times you may notice is when transferring files or trying to stream HD media to a mobile (since devices like phones have weaker antennas). So what should you look for in a new 802.11n router?



AVM's Fritz!Box Fon WLAN 7390 has both USB ports and VoIP – yet another feature you can look for in your new 802.11n router.

Five things to look for in a new 802.11n router

- 1 Support for 450Mbps.** 802.11n comes in many flavours, from 150Mbps single antenna cheapies to the 450Mbps speedsters. Try to get one that supports 450Mbps wireless, since they're now more affordable. Wireless performance genuinely scales in a linear fashion, so 450Mbps will really be close to 50% faster than a 300Mbps router. At long range, that could be the difference between stuttering and flawless playback.
- 2 Dual-band support.** You'd be hard pressed finding a new router that *isn't* dual band. They're a great way to avoid network congestion, since you can use them in the 2.4GHz band or switch to the 5GHz band.
- 3 Gigabit wired networking (on all the ports).** An unfortunate number of 802.11n routers still use 100Mbps Fast Ethernet on their LAN and WAN ports. Avoid these like the plague. Fast Ethernet, while good enough to handle most media streaming, thanks to consistent speeds

provided by wired networking, is very slow for copying files. It's also insufficient for NBN speeds. On a 100Mbps NBN connection, your local network will bottleneck your performance if you have Fast Ethernet.

- 4 An Ethernet WAN port.** Just as with 802.11ac routers, you should look for an ADSL router that either has an additional dedicated Ethernet WAN port or can reconfigure a LAN port as a WAN port. If yours doesn't have them you'll have to replace it when you get the NBN.
- 5 Media sharing from USB ports.** A router with USB ports gives you a cheap and easy way to set up your home NAS. Plug a USB hard drive into one of these ports, and BAM – instant NAS. Look for a router that supports DLNA media sharing, since that's what most network media players – including Xbox 360 and PS3 – support. Access to the shared drive via Windows File Sharing makes it easier to upload files, too.

APC picks:

THE BEST BUDGET 802.11N ROUTER

TP-Link TL-R2543ND

@ www.tp-link.com.au \$ \$75

If you want 450Mbps networking at the lowest possible price, it's hard to go past TP-Link's TL-R2543ND. Available in some stores for as little as \$57, the networking hardware built into the broadband router

supports full 450Mbps wireless speeds and Gigabit networking on both the LAN ports and the WAN Ethernet port. It doesn't have a built-in modem, but if you just want something to boost your wireless network, this is a very cheap way to do it. Of course, don't expect everything to be top of the line at this price. The firmware of the TP-Link is a little on the rough side, but its feature set is solid and it even has a USB port for sharing an external hard drive.



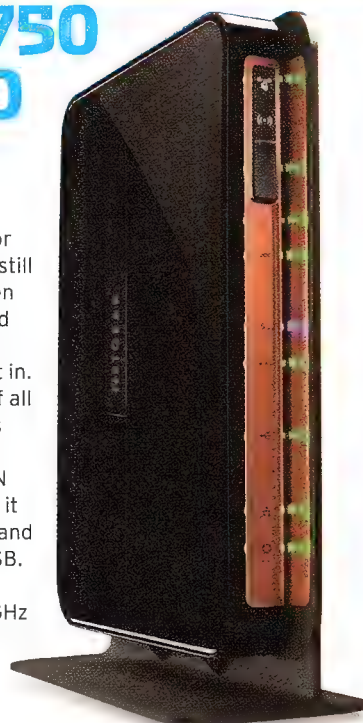
APC picks:

THE BEST ADSL-EQUIPPED 802.11N ROUTER

Netgear N750 DGND4000

@ www.netgear.com.au \$ \$199

For reasons that escape us, ADSL modem routers with full support for 450Mbps wireless networking are still a rare sight. If you want it, you often have to look at getting a broadband router in addition to a modem, as opposed to having the modem built in. But the DGND4000 has the best of all worlds. It has 450Mbps wireless as well as Gigabit Ethernet, an inbuilt modem and an extra Ethernet WAN port so it's ready for the NBN. And it has excellent firmware, easy setup and file and printer sharing through USB. Note that 450Mbps wireless only works in the 5GHz band, while 2.4GHz is limited to 300 – but it's a fast modem router for a decent price.



MAXIMISE YOUR WI-FI SPEEDS

So you have your new 802.11ac or 802.11n routers and adapter ready to go. Now you just have to set up your home for optimal wireless performance. Wireless, you see, is a fickle beast. A million factors affect the performance of your wireless network, and you can't just plonk the router anywhere and expect it to work at optimum speeds and reliability. Here are seven ways you can ensure good performance.

1 Range is the most important factor in wireless performance.

Nothing affects the speed and reliability of a wireless connection like the range between the access point and the devices that use it. The closer they are, the better. For that reason, you want the wireless router to be placed at the epicentre of your wireless activity, rather than at the periphery. In general, that means putting it somewhere physically close to the middle of your house or unit, rather than hidden in a corner room or buried in the attic or basement. If the location of your broadband connection dictates where you have to put the router, you have several repositioning options. The easiest is just to extend the cable of your broadband connection. If you're on ADSL, phone cables are cheap, and you just need to buy a longer one in order to reposition the router. An alternative is to have a separate modem and access point. You can buy either a dedicated wireless access point or a wireless router that you're only going to use as an access point. Then you run an Ethernet cable from a LAN port on your modem router to a LAN port on the access point to give wireless devices access to the modem.

2 Think about what the wireless signal has to go through to get from point A to point B. This is too often neglected when people are setting up their wireless network.

Wireless signals can travel through walls and other objects, but the success at which they do so is determined by the composition of the things it has to go through. Travelling through plaster and wooden interior walls is easy, for example, but beaming through double brick or concrete is not. Some of the things that will rapidly reduce the strength of wireless signals include:

- brick walls
- tiles and mirrors
- lead-based paints
- concrete

And then there are your complete show stoppers, including:

- metal plates and chicken wire in walls
- water (for example, fish tanks)

If you have these kinds of walls and surfaces in your home, you need to think about positioning your wireless router to minimise their impact.

Putting it next to a fish tank, for example, will likely create a large shadow in the wireless reception area. Angles are important too. You want the signal to travel through solid material for as little time as possible. If a wall between the router and adapter is at an oblique angle to the line between the two, there will be more signal loss than if the wall is perpendicular to the line between the access point and receiver. That's because the signal has more solid material to pass through.



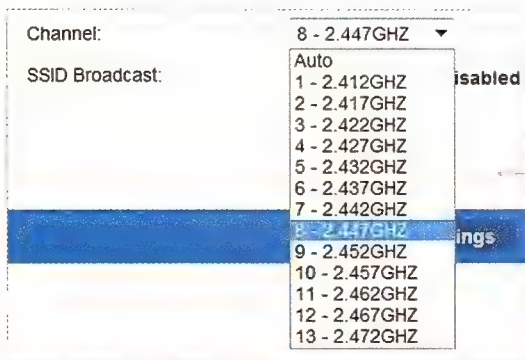
Reception from a vertical antenna works better on the plane rather than vertically.



3 Verticality. So you live in a multistorey home, or you have the idea to put the router in the ceiling, under the floor or in the basement. This is a tricky business, because the angle of the antenna can make a big difference. A standard dipole antenna (the kind that sticks vertically up out of the back of a router) for example, has roughly even coverage on a horizontal 2D plane around the antenna. Above and below the antenna are weak points where signal reception won't be as good. If you put the antenna in a vertical position, you won't get as good reception 2m above it as you would 2m to the side. In short, you don't get even spherical coverage from any antenna you find in modern routers. That can make the vertical positioning of the router a tricky proposition. It's definitely not a good idea to put the router in a basement or in the ceiling, because if you were standing directly above it or below it, your reception may be off. In fact, if you live in a large multistorey home, it's often a good idea to set up multiple routers (one for each floor), and connect them via an Ethernet cable. Of course, it's hard to know the exact alignment of antennae when your router has them internally like so many do now. In many cases, you'll have to engage in a little trial and error when it comes to vertical position of your routers. Try rotating, tilting, wall-mounting and other positions to see which get the best reception.

4 Choose a band. 802.11n routers can work in either the 2.4GHz or 5GHz radio frequency spectrum. A little bit of experimentation might be required to work out which works best for you. As a rule, 2.4GHz has better range characteristics and travels better through walls and other materials thanks to its lower frequency. It's also more compatible; not every 802.11n device supports 5GHz, but they all support 2.4GHz. But it's also highly congested, with baby monitors, security cameras, cordless phones, wireless headphones and much more using the same spectrum. And then there's vulnerability to 2.4GHz interference from microwave ovens. 5GHz, on the other hand, is pretty much only used by Wi-Fi, and you may get better performance on it in your home. As we said, experiment. Maybe run a few file copy tests to see how each performs. If you use 802.11ac, you don't have a choice. 802.11ac only uses 5GHz (though most devices will also support 802.11n in the 2.4GHz band for 'legacy' compatibility).

5 Choose a channel. The 2.4GHz and 5GHz bands are broken into discrete 20MHz channels. That's done so multiple Wi-Fi devices can coexist in the same area without stepping on each other's toes too much. If you live in an area with multiple overlapping wireless networks, you may need to tinker with the router's channel settings to get best performance. It's usually a matter of trial and error. You log on to your router's admin page, go to the wireless settings and randomly choose a channel and see how it goes. Run some file copy tests. See what kind of reception you get. There are some things you can do to speed this process up, however. Many routers default to either channel 1 or channel 6, so start with channel 3, 4, 8 or higher. They're less likely to be used. Even better, get a tool like Wi-Fi Analyzer, an app for your Android phone available on Google Play. It gives you an overview of what other networks are in the area and what channel they're using, allowing you to choose a channel that's free and clear from competition.



Wireless routers let you choose which of the available channels you'd like to use. You can switch channels to dodge congestion.

6 Upgrade your antenna. If you have a router with external, detachable antennae, you can swap them out for something with a bit better gain. At most, your factory router is likely to have antennae with 5dBi gain (and often only 2dBi), but you can replace them with an omnidirectional antennae with 7, 9, 11, 14 or even more dBi gain. This should improve the range and reception of your wireless signals. You can also look at 'patch panel' directional antennas. These offer higher gain and range than omnidirectional antennas, and can sometimes be useful if you need to position the antenna at the edge of your home, or if you need long-range outdoor reception.

7 Keep it away from EM interference. All electronic equipment emits EM radiation, and EM radiation is bad for radio signals. It's best to place your router away from other electronic equipment for this reason. Don't jam it in your AV cabinet with your other electronic gear, and most definitely do not put it near CRT TVs or monitors or on top of loudspeakers.

DON'T FORGET WIRED NETWORKING!

We've talked a lot about wireless networking here, but you shouldn't forget wired networking. The fact of the matter is, as far as Wi-Fi has come it still can't compete with a wired connection between devices. Wireless is prone to performance dips and random disconnects and almost never gets anywhere near the listed theoretical maximum in the real world. Wired connections, on the other hand, provide consistent performance, security and reliability. Straight up, a Gigabit Ethernet connection beats any type of Wi-Fi connection on every metric except mobility. If you have fixed devices and the ability to run cables between the router and them, it's almost always worth doing so. If you're going to the trouble of running cables, here are some tips to help things go more smoothly.

- Ethernet has a range of 100m (and more), so don't worry about cables being too long.
- Many electronics stores will make cables to order, at lengths you specify.
- The plastic casing on Ethernet cabling is waterproof, but if you're running it outdoors it's best to surround the cable in PVC piping to keep it safe in case of wear or rot. You can also get outdoor Ethernet cables.
- Category 6 cabling is a better option than Cat 5e, and there's very little price differential. Not only does it have better signal characteristics, it will be capable of handling 10 Gigabit Ethernet when it comes along. If you're going to the trouble of running cable through wall ducts, ceiling or under floors, you may as well prepare yourself for the next evolution of Ethernet so you won't have to do it again.
- Tight kinks and bends in the cable can reduce its performance – this is especially true for Cat 6 cables. Try to minimise them when running cables.

With APC Back-UPS, your digital life goes on... even when the power goes off.

Preserve what's most important to you.

Reliable power backup for 24/7 availability

Whether DVRing your favorite show, updating your Facebook status, or playing a live networked game, you depend on your home electronics every day, all day. That's why APC by Schneider Electric has designed battery backup solutions that protect the constant availability and connectivity you expect... and depend on.

Peace-of-mind protection on two levels

When the power goes out, our popular Back-UPS units go to work. They instantly switch your home technologies to emergency power, allowing you to work through brief power outages or safely shut down your systems so you won't lose valuable files—such as digital photos and media libraries. They also feature surge outlets to guard your electronics and data from "dirty" power and damaging power surges—even lightning. So you get two levels of protection in every APC Back-UPS unit!

Energy-saving insurance for what matters most

Our Back-UPS units protect your home office, digital living and home media applications, notebook computers, DVRs, and gaming application. And since we now offer energy-efficient models that reduce electricity costs through unique power-saving outlets, you can realise true energy savings regardless of the applications you're backing up. Throughout your home, the APC Back-UPS is the cost-saving insurance you need to stay up and running and reliably safeguarded from both unpredictable power and wasteful energy drains.



Keep your electronics up and your energy use down!

ES Series

The ever-popular ES models are priced affordably yet provide enough extended runtime to allow you to work through short and medium power outages. Some power-saving models have been designed to actively reduce energy costs.

The energy-efficient ES 700G

The ES 700G boasts innovative power-saving outlets, which automatically shut off power to unused devices when your electronics are turned off or asleep, eliminating wasteful electricity drains.

- 8 Outlets • 405 Watts / 700 VA
- 68 Minutes Maximum Runtime**
- Telephone/Network Protection



The best-value ES 550G

The ES 550 uses an ultra-efficient design that consumes less power during normal operation than any other battery backup in its class, saving you money on your electricity bill.

- 8 Outlets • 330 Watts / 550 VA
- 51 minutes Maximum Runtime**
- Telephone/Network Protection



Power up to **WIN 1** of 3 APC ES700G Battery Back-UPS units!*

Visit www.apc.com/promo Key Code **52944K**

APC
by Schneider Electric

MIGRATING TO A NEW WIRELESS ROUTER

So you've got your new wireless router. Now it's time to set it up. Just follow these steps.

- 1 Before you go unplugging your old router,** gather up all your details. To set up your new router, you should try and collect:
 - The username and password for your broadband connection.
 - Your wireless network's SSID and password (reusing them will save you from reconfiguring the wireless devices in your home).
 So it's been years since you set up your old router and you've totally lost those details? You can still check them by logging on to your old router's administration page in your web browser. Hopefully you have it bookmarked and the password saved, but if not then most routers use a default IP address of 192.168.0.1 or 192.168.1.1, with a default username of 'admin' and password that's empty or something like 'password' (though shame on you if you never changed these!). On the main page you'll see your connection settings. Note any settings you see: the connection type (usually PPPoE), the ISP username, the ISP password (though this may be hidden; in that case you'll need to contact your ISP for the password if you don't know it).
- 2 Plug the broadband cable into your new router.** So you've gathered the data from your old router. It's time to put it on the new one. First of all, plug the broadband cable into the appropriate port on the new router (either the WAN port or the ADSL port). Power on the router.
- 3 Connect your PC to it via an Ethernet cable.** For the initial setup, you'll need to connect your computer to the router with a wired Ethernet cable. (Yes, technically in some cases you may be able to use push button wireless authentication, but in most cases using a wired cable is much easier).

Internet Setup

Internet Connection Type: PPPoE

Username: myispusername

Password: *****

Service Name (Optional):

Connect on Demand Max Idle Time 15 Minute

Keep Alive Redial Period 30 Second

Optional Settings (required by some Internet Service Providers)

Host Name

Domain Name

MTU: Auto Size:

Your router's settings to connect to your ISP. You'll need these to set up your new router. Then go to 'wireless settings' and note the exact SSID (also known as the network name) of your current network, including the use of upper case and lower case.

- 4 Log on to your new router's administration page.** Most new routers come with a quick setup CD that will take you to the router administration page and may even run you through a setup wizard. If not, they'll come with instructions on how to access the admin page in the manual.
- 5 Configure the internet connection.** The first thing to do is get your internet connection up and running. Go to the main setup page, and enter your ISP-provided username and password into the appropriate fields. You may need to change the connection type as well. If you're on ADSL or most other types of broadband, the internet connection type will be 'PPPoE'.
- 6 Configure wireless settings.** Now head to your router's wireless settings. The first thing you may notice, if you're on a new dual-band router, is that there are two connection settings. That's because a dual-band wireless router is effectively two access points at once: one in the 2.4GHz band and one in the 5GHz. In the settings for the 2.4GHz band, enter your old SSID. In the settings for the 5GHz band,

Wireless

Setup Wireless Security Storage Access Restrictions Applications & Gaming Administration

Configure Wireless Settings

Configuration View

Manual Wi-Fi Protected Setup™

5 GHz Wireless Settings

Network Mode: Wireless-N Only

Network Name (SSID): myhomework

Channel Width: 40 MHz Only

Channel: Auto (DFS)

SSID Broadcast: Enabled Disabled

2.4 GHz Wireless Settings

Network Mode: Mixed

Network Name (SSID): xnet

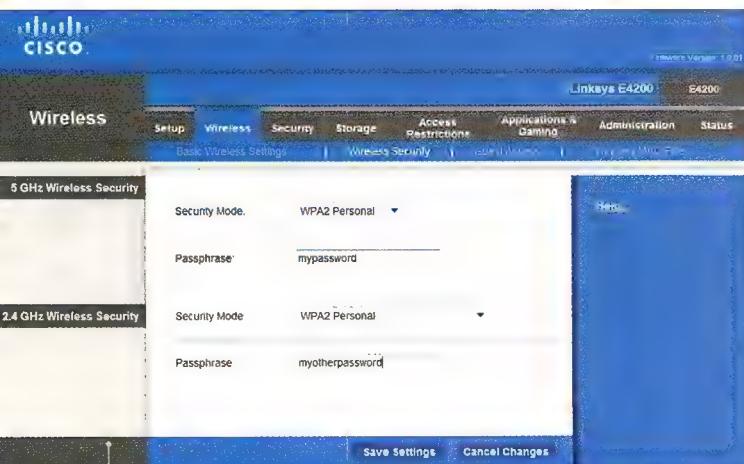
Channel Width: Auto (20 MHz or 40 MHz)

Channel: 8 - 2.447GHz

SSID Broadcast: Enabled Disabled

Save Settings Cancel Changes

Make a note of your current network names (SSID). You don't need to worry about the other stuff like channels and band, because that will be different on your new router. Now go to your wireless security setting and make a note of your current wireless password. We'll be reusing this.



Gather your old wireless password.

enter a new SSID (you can use whatever you like, but it has to be different to the 2.4GHz SSID). You also want to max out the settings. For each band set the network setting to either 'mixed' or whatever the best one is allowed. If it's an 802.11ac router, you want the network setting in the 5GHz band to support 802.11ac, not be limited to 802.11n. 802.11ac will not be available in the 2.4GHz band. The channel width should be either set to 'automatic', or the highest channel width possible (40MHz on an 802.11n router, 80MHz on a 802.11ac router). The channel number you can just leave at its default or on 'automatic' for now. You can twiddle with it later to tweak performance.



The AR9004TB chip from Qualcomm subsidiary Wilocity, the first tri-band chip to support 802.11ad and 60GHz Wi-Fi.

802.11AD, THE NEXT EVOLUTION

So there you were, thinking that 802.11ac was the latest and greatest. Well, a group called the Wireless Gigabit Alliance has developed something even faster, and it's been submitted for standards certification as 802.11ad. The first 802.11ad devices were already on display at this year's Consumer Electronics Show in Las Vegas.

Before you go and scrap your plans for an 802.11ac network, however, you should know that 802.11ad is not really a replacement for 802.11ac. It's more like a short-range speed booster.

802.11ad works in the 60GHz spectrum band, while 802.11ac works in the 5GHz band. That's significant. At 60GHz, 802.11ad can use huge radio channels to transmit data. Initial demonstration chips from Wilocity hit 4.6Gbps (that's close to USB 3.0 speeds) and that's expected to jump to 76Gbps or more. But there's a price to pay. At 60GHz, signal strength drops off very quickly, and signals don't travel at all well through walls and other obstructions. In short, 802.11ad is only good for transmitting data between devices in the same room as each other. If you're in another room, 802.11ac will do much better.

What appears likely – and this is certainly the way Wilocity is going with its initial chips – is that we have multi-band chips that dynamically switch between 802.11ac and 802.11ad depending on the signal strength detected.

At the moment, 802.11ad is still in the product demo phase. There have been no consumer products announced and no devices that support it natively. But in the next few years we may well see new routers that support 802.11ad in addition to 802.11ac, providing a super speed boost for devices in the same room as each other and serving as potential wireless peripheral connections for devices like hard drives and printers.

7 Configure wireless security. Head over to the router's 'wireless security settings'. The go-to setting is 'WPA-2' with a password, also known as pre-shared key. You can use your old wireless network's password. Again, you will have separate security settings for the 2.4GHz band and the 5GHz band. In this case, you can actually set identical passwords and security settings for each, which will save you having to remember multiple passwords. Note that if your old network used the outdated WEP security setting, your password was probably a long string of numbers and letters. You don't have to use that anymore if you don't want to. WPA is more flexible about its passwords. Save the settings and wait for the router to update (possibly requiring a reboot).

8 Connect a wireless device to the network. Now it's time to test her out. Go to any wireless device in your home and browse the available wireless networks. You should see one or both (depending on whether the device supports 5GHz) wireless network SSIDs. Try to connect to one, and enter your WPA2 password when prompted if necessary. If you're lucky it should connect, and – assuming your router connected to the ISP properly – have immediate internet access. And that's all that's required – you've now vastly increased your wireless speeds – either from the slow 802.11g to 802.11n, or to super-fast 802.11ac just by effectively swapping out your router and entering a few configuration details. There may still be more to do – stringing cables to wired devices, tweaking settings, moving the router for better reception – but you've got the basics down and are up and running with your new super-fast network. [APC](#)

HOW SIGNAL QUALITY IS CALCULATED

Ultimately, the performance of a wireless connection comes down to its signal-to-noise ratio (SNR). If you're looking to build the best wireless network, it's worth knowing how that is calculated.

The quality of a wireless signal comes down to two factors: the signal strength and the noise. The signal strength is a representation of how much power is left in the signal when it reaches its destination. The further away from the source, and the more intervening barriers between them will mean a more diffused signal. Noise is what you might call interference. It's the snow at the top and bottom of your old analogue TV signal, or the static in an FM radio broadcast. Noise is caused by a million factors; electronic interference and crosstalk, humidity, heat and many other things. It represents the proportion of the signal that is 'good' data versus 'junk' data.

The SNR is essentially a product of those two factors, and it's the final determinant of speed. It's calculated as the power of the signal divided by the power of the noise. So $SNR = P_{\text{signal}} / P_{\text{noise}}$. Usually the measurement of wireless signal strength is in decibels. If you look at it this way, you can see that you can have a very strong signal, but awful throughput because of noise, or a weak signal and good throughput if you're in a noise-free environment. It's something to think about when you're setting up your wireless network as power and noise are both factors you have to take into account.

THE GAMING PC SPECIAL

Is your current gaming rig holding you back? [Darren Yates](#) creates four new builds to power you to victory, no matter what your budget.

PREMIUM GAMING SYSTEMS

When you're ready to muscle up with a no-limit gaming rig, you'll likely end up with a multi-GPU/multi-monitor setup – the only question is how you get there. Rather than a single option, we've created two different builds and we'll explain the rationale behind them as we go.

GRAPHICS CARDS

For a three-monitor setup, we think it's either a two-way GTX 680 or three-way GTX 670 SLI build. But there are a few checkpoints. First, with 5,760 x 1,080/1,200-pixel (6/7MP) resolution across three monitors, VRAM becomes an issue on some games. For example, *Metro 2033* and *Crysis 2* slow considerably with just 2GB at that resolution. New 4GB GTX 670/680 cards should help. Some games can be a bit touchy with three-way SLI, but if you're going to this extreme, 4GB cards make sense. For a cheaper alternative, two overclocked GTX 670 cards should get close to two-way stock-clocked GTX 680 SLI performance.

If you do go for three GTX 670 cards, make sure they're only dual-slot width. Some models have high-profile coolers that may not fit on your board in a three-way SLI setup. And lastly, add another \$5 for the SLI bridge connector – it won't come with the cards.

MOTHERBOARD

By choosing three-way SLI, there's a PC platform choice to make. Intel delivers the best performance levels, yet you've got two options: pro-grade LGA2011 or mainstream LGA1155. The main gaming difference, apart from price, is the number of PCIe lanes available.

Sandy Bridge E/LGA2011 CPUs (unofficially) have 40 PCIe 3.0 lanes, so they can run a two-way SLI setup at full 16x/16x speed, whereas LGA1155 is stuck with 16 lanes and has to drop back to 8x/8x. In practice, 8x on PCIe 3.0 is the same as 16x on PCIe 2.0, so with current hardware, you're unlikely to see a significant performance difference between the two on two-way SLI builds. In a three-way SLI setup, LGA2011 can deliver those 40 lanes in a 16x/8x/16x configuration, while the best Z77-based LGA1155 boards will do is an 8x/16x/8x array if the board has a PLX multiplex chip, otherwise it's 8x/4x/4x.

Haswell/LGA1150 isn't far away if you can wait, but it too will only have 16 PCIe lanes, although its rumoured variable base clock will make overclocking easier.

Given all that, we've chosen the ASUS Rampage IV Extreme (X79 chipset/LGA2011) and Gigabyte G1 Sniper 3 (Z77/LGA1155 with PLX) boards here. Each allows up to quad-SLI/CrossFire gaming.

Let's say it now: LGA2011 is overkill for all but the most serious gamer. Making things trickier,

Nvidia defaults PCIe speed on Sandy Bridge E to 2.0-spec with its GTX 670/680 driver software. You can force PCIe 3.0 in the BIOS on newer LGA2011 boards, although you'll also need Nvidia's 'use at your own risk' utility (tinyurl.com/agdt78w) to make it work. Check with GPU-Z (www.techpowerup.com/gpuz) first and run the utility if GPU-Z says the board is running at PCIe 2.0.

PROCESSOR

The Core i7-3770K is the choice for a solid LGA1155 system – it's the best CPU this platform has and is reasonably priced.

The LGA2011 build is easy to CPU up, too – the Core i7-3930K is a cracking chip and much better value than the i7-3960X. With six cores and 12MB of cache on a variable base clock, the i7-3930K will easily overclock and outlive several GPU generations. Again, it's overkill for gaming, but if you drop back to the quad-core i7-3820 chip, it's arguable you may as well choose the LGA1155/i7-3770K build instead.

PROCESSOR COOLING

The Core i7-3770K comes with a stock cooler, which is fine if you're not overclocking, but the i7-3930K has nothing. If you're overclocking or choosing the LGA2011 build, go with Noctua's NH-D14 air cooler. There are two versions, so get the LGA2011 model if you build that system. It's a massive unit so check that your RAM will fit underneath it. More moderate overclocking can be done with Cooler Master's cheaper Hyper 212 EVO. There's also Corsair's \$100 Hydro H60 SE water cooler – the magnetic mounting bracket makes it easier to install.

STORAGE

If there's one thing to lament about Intel, it's the slowness in bringing new technology to market and the LGA2011 cops it hard. Apart from X79 only featuring two SATA 6Gbps ports, its PCIe 3.0 support is a patch job and you still can't use TRIM on SSDs in a RAID 0 setup. X79 uses RSTe – Intel's enterprise-grade Rapid Storage Technology – and it needs a BIOS and driver update before it'll support RAID 0 TRIM. Intel promised back in August 2012 that RAID TRIM support for X79 would arrive 'soon', but at the time of writing, availability was still patchy. TRIM is a command that allows for background



ASK US!

Looking to make your perfect PC, but not sure what parts to buy? Every month, our PC expert [Darren Yates](#) solves a readers' PC building quandary. Email us at contact@apctest.com for your chance to get building!

garbage collection on SSDs to ensure storage blocks no longer used are clean for the next write, maintaining maximum speed. Intel recently released new Z77-series RST drivers that enable RAID 0 TRIM on these boards.

We've gone for two 480GB Corsair Force GTs in both builds – we'd RAID 0 them on the LGA1155 build, but keep them separate on the LGA2011 setup until ASUS officially launches a new BIOS ROM with RAID TRIM support.

PSU

Choosing a power supply for an SLI rig requires horse trading – you want sufficient capacity to power the system, but not too much that efficiency is reduced. The lower the efficiency, the greater your power bill.

We've chosen Seasonic's 1,000W XP-1000 Platinum on the LGA2011 build and the M12II-850 Bronze for the LGA1155 setup. Seasonic is one of the better PSU manufacturers and builds solid, good-value PSUs. The M12II-850 could be enough for three stock GTX 670s, but not on an overclocked rig.

MONITORS

There's plenty to think about: PLS, IPS or TN; 60 or 120Hz; 16:9 or 16:10 aspect ratio. Much of it will come down to personal preference, so we've selected two completely polar 24in options: BenQ's XL2420T (TN/120Hz/16:9) and Dell's UltraSharp U2412M (IPS/60Hz/16:10).

The Dell lacks HDMI, sporting DisplayPort instead, but costs as little as \$299 if you shop around (try Harris Technology). The argument over 16:9 or 16:10 aspect ratio disappears when you go for three monitors, while the smoothness of the XL2420T's 120Hz panel will mean more than the U2412M's richer colour gamut to some, less to others.

Both monitors allow full three-way landscape (5,760 x 1,080/1,200 pixels) or portrait (3,240/3,600 x 1,920) setup. The XL2420T also has 3D capability.

PC CASE

Both motherboards we've selected are Extended ATX form factor (30.5 x 27.2cm). Add in the fact that the GTX 680 cards aren't exactly small and you'll need a full tower case to comfortably fit everything in.

We'd choose Fractal Design's Define XL tower for both systems. It handles E-ATX boards, Noctua's NH-D14 cooler and long-length graphics cards comfortably, plus it also comes with noise dampening and cooling fans ready to go.

INSANELY FAST GAMING PCs

	Build #1 – LGA2011	Cost	Build #2 – LGA1155	Cost
CPU	Intel Core i7-3930K	\$580	Intel Core i7-3770K	\$340
CPU cooler	Noctua NH-D14 (LGA2011 version)	\$90	Cooler Master Hyper 212 EVO	\$40
Motherboard	ASUS Rampage IV Extreme	\$510	Gigabyte G1 Sniper 3	\$360
RAM	2 x 8GB DDR3-2400	\$130	2 x 8GB DDR3-2400	\$130
Graphics cards	3 x Gigabyte GTX 670 OC 4GB	\$1,530	2 x Gainward GTX 680 Phantom 4GB	\$1,250
Storage - SSD	2 x Corsair Force GT 480GB	\$1,030	2 x Corsair Force GT 480GB (RAID 0)	\$1,030
Optical drive	Pioneer BDR-207DBK Blu-ray burner	\$95	Pioneer BDR-207DBK Blu-ray burner	\$95
Monitors	3 x BenQ XL2420T 24in	\$1,590	3 x Dell UltraSharp U2412M 24in	\$900
Operating system	Microsoft Windows 8 Professional OEM 64-bit	\$150	Microsoft Windows 8 Professional OEM 64-bit	\$150
Case	Fractal Design Define XL	\$200	Fractal Design Define XL	\$200
PSU	Seasonic XP-1000 Platinum 1,000W	\$340	Seasonic M12II-850 Bronze 850W	\$200
	TOTAL COST	\$6,245	TOTAL COST	\$4,810

The Fractal Design Define XL tower case is big enough to hold everything.

Noctua's NH-D14 cooler is as good as it gets for non-water cooling.

Corsair's Force GT is one of the fastest SSDs available.

Nvidia's GeForce GTX 670, a potent card in SLI mode.

The ASUS Rampage IV Extreme is about the best LGA2011 board around.

the lab

AFFORDABLE GAMING SYSTEMS

As much as we'd all like to throw a boatload of cash at our individual gaming PC ideal, reality has a habit of setting in and we compromise. Even aside from the cash, few would have the room to set up three big-screen monitors, so something slightly more modest will probably be the order of the day. Since most of us are constrained by budgets, we've come up with two builds that aim to maximise performance and enjoyment without torturing the credit card – much. Again, we'll talk about our rationale as we go about building the systems, priced at roughly \$1,500 and \$2,500, respectively.

GRAPHICS CARDS

At \$1,500, you've got just enough cash to sensibly load up on a GeForce GTX 670 or Radeon HD 7970 – a GTX 670 will cost about \$410 while the HD 7970 starts at around \$430. Our preference would be the GTX 670 based on its lower price and power consumption.

At \$2,500, there's enough room to splash out on two 2GB GTX 670 cards in SLI, which should deliver a sizeable dent into any game for the foreseeable future. If you choose overclocked GTX 670 cards, you should get pretty close to stock GTX 680 performance, although you'll push out your budget a bit (and possibly need a PSU upgrade) to do it.

MOTHERBOARD

Realistically, if you can't wait until Haswell arrives, LGA1155 is the only viable option for a decent gaming system under \$2,500, let alone \$1,500. Gigabyte's GA-Z77MX-D3H delivers a great little solution for its \$120 street price. With USB 3.0, two SATA 6Gbps ports, two PCIe 3.0 x16 slots (x8 in SLI) and SLI/CrossFire support, there's enough in this board to make a \$1,500 build punch well above its weight. In fact, it's good enough to run our \$2,500 setup, too.

The PCIe x16 slots are also well spaced apart, so you shouldn't have too much trouble keeping both cards well within their temperature specs – even if you indulge in a little overclocking.

PROCESSOR

For both builds here, we've gone for Intel's cheaper quad-core Core i5-3570K chip. It's still highly overclockable and \$110 cheaper than the Core i7-3770K. You do lose Hyper-Threading and 2MB of cache with the i5-3570K, but in practice, you'll be hard pressed to notice any performance differences, even on SLI gaming. While a \$1,500 budget means that we have no choice but to use the i5-3570K processor in that build, our \$2,500 setup gains from the \$110 saving with better choices for the case and PSU to almost bulletproof levels.

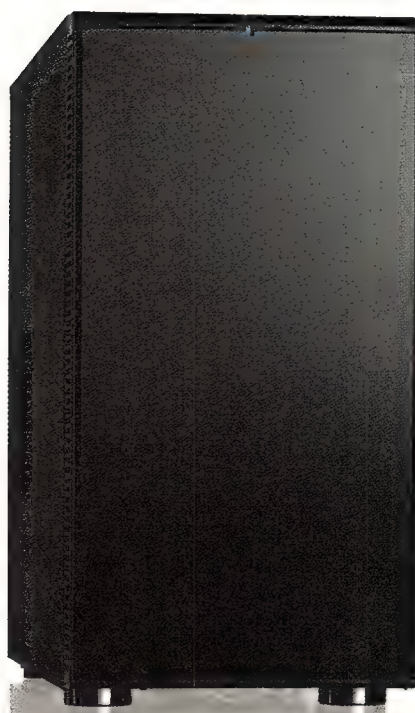
STORAGE

SSD prices are coming down at a decent clip now, yet budgetary constraints mean we can't go nuts and load up. So with SanDisk's 240GB Extreme SATA 6Gbps SSD down to around \$180 on the street, we've gone for one of these in the \$1,500 build and two in the \$2,500 setup. You're still looking at around \$380 for a 480GB SanDisk Extreme, so we've saved \$20 or so with two 240GB drives instead. We're suggesting RAID 0 to up the speed in the \$2,500 system, but the choice is yours. Sure, the Extreme isn't the fastest SSD going around, nor does it offer a boatload of space, but in a gaming rig it's still enough to have a good number of games available and maximise performance despite our anaemic budgets. And the Z77 will give you TRIM support in a RAID 0 setup.

PSU

The great thing about Nvidia's 600-series GPUs is the reduced power requirements, so much so that the GTX 670 can get away with a 500W PSU. And while it's tempting to go for a sub-\$100 case with a built-in 500W PSU, we'd recommend a cheaper case and a higher-quality PSU. That's what we've done, selecting Antec's Seasonic-built 520W NEO ECO 520C as the most affordable worthwhile sub-\$100 option.

For the \$2,500 setup, we've gone for Corsair's TX-750 V2, which should be just right for two GTX 670 cards. The TX-750 V2 is another PSU manufactured by Seasonic, so it'll have good build quality.



The Fractal Design Define R4 is one of the quietest cases available.

AFFORDABLE GAMING PCs

	Build #1 - under \$1,500	Cost	Build #2 - under \$2,500	Cost
CPU	Intel Core i5-3570K	\$230	Intel Core i5-3570K	\$230
Motherboard	Gigabyte GA-Z77MX-D3H	\$120	Gigabyte GA-Z77MX-D3H	\$120
RAM	8GB G-Skill Ripjaws DDR3-1600	\$49	8GB G-Skill Ripjaws DDR3-1600	\$49
Graphics cards	Galaxy GTX 670 GC 2GB	\$410	2 x Galaxy GTX 670 GC 2GB (SLI)	\$820
Storage - SSD	240GB SanDisk Extreme	\$180	2 x 240GB SanDisk Extreme (RAID 0)	\$360
Optical drive	Samsung SH-224BB DVD burner	\$20	Samsung SH-224BB DVD burner	\$20
Monitor	Dell UltraSharp U2412M 24in	\$300	BenQ XL2420T 24in	\$530
Operating system	Microsoft Windows 8 OEM 64-bit	\$99	Microsoft Windows 8 OEM 64-bit	\$99
Case	Cooler Master Elite 334U	\$45	Fractal Design Define R4	\$150
PSU	Antec NEO ECO 520C 520W	\$80	Corsair TX-750 V2 750W	\$150
	TOTAL COST	\$1,533	TOTAL COST	\$2,528

MONITORS

IPS monitors get a bad rap from some gamers because of their comparative slowness against TN models, but the viewing angles and vastly richer colours are just as important in our view. Dell's UltraSharp U2412M gets the thumbs-up from us and is a good gaming choice, despite being a 16:10 aspect ratio. You can grab it for \$296 from Harris Technology, so don't pay Dell's \$399 price tag.

For the \$2,500 system, we've suggested BenQ's XL2420T again, although you might want to also consider Dell's brand-new yet slightly more expensive UltraSharp U2913WM. This 29in ultra-widescreen IPS monitor delivers 2,560 x 1,080-pixel resolution in a 21:9 aspect ratio. We're still waiting to test this unit as it was only released at the tail end of 2012. For first-person shooters and racing sim games that support variable FOV, it's a more compact option than surround monitors, cheaper to run and won't need the same GPU horsepower, thanks to the lower pixel count.

We'd recommend you see it in action first before considering it, just to be sure it suits your needs, but it's definitely an interesting option. You can get an idea from various YouTube clips at tinyurl.com/aqtednx. The one at tinyurl.com/cyxmfd gives you a good, long view with various games including *DiRT 3* and *H.A.W.X. 2*, so there's no denying its potential.

PC CASE

When the budget is only \$1,500, you can't have everything you want, but Cooler Master's low-cost Elite 334U gives us a basic mid-tower case for around \$45 and should have no trouble housing a single GTX 670 card.

For the \$2,500 build, we've chosen Fractal Design's Define R4 case, which is a more compact version of its Define XL series. It's roomy enough and also includes noise-deadening bitumen in the side panels, along with two 140mm hydraulic-bearing fans, so it'll be as quiet as it is cool. Personally, I prefer an understated chassis like the Define R4, but if you'd rather something more dramatic, Cooler Master's CM Storm Trooper is another, if somewhat larger, option at a similar price.

If your budget will allow, try not to skimp on the case or the PSU in particular – gaming is one application where good-quality components here will make a difference in the long term.

UPGRADES

When you're constrained by a budget, you don't have the luxury of building in too much headroom for future growth. Both of these systems have CPU and motherboard support for faster graphics cards; however, unfortunately neither build has sufficient PSU power reserves to go with them. As it is, we're already nudging our agreed budgets. That said, while there might not be much in the way of growth options, both systems should provide good performance levels for a proportionally decent length of time.

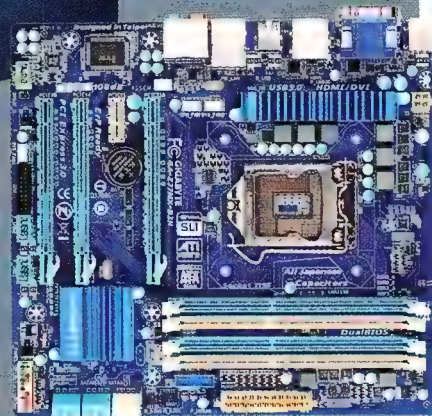
GET BUILDING!

As you can see, there's plenty to consider when you're building a gaming PC and the choices can be mind-numbing. We've had trouble limiting ourselves to just four system builds and covered a price range of around \$1,500 to a bit over \$6,000.

There should be enough there to get you thinking about your next build. **adc**



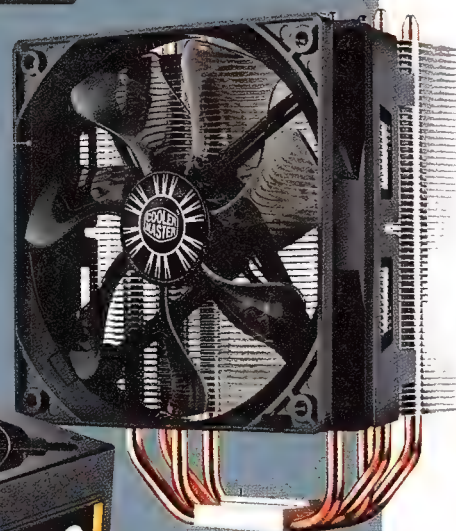
Intel's Core i5-3570K is the ideal gaming CPU.



Gigabyte's GA-Z77MX-D3H is well featured despite its \$120 price tag.



SanDisk's 240GB Extreme SSD is one of the cheapest available.



Cooler Master's Hyper 212 EVO is a cost-effective cooler.



Corsair's TX-750 V2 power supply, made by Seasonic.



Windows 8 Store

DROPBOX ARRIVES

One of the killer cloud apps finally comes to the Windows 8 Store — crippled. [Tony Sarno](#) explains.

Dropbox for Windows 8

Free | Dropbox | tinyurl.com/afeckaq

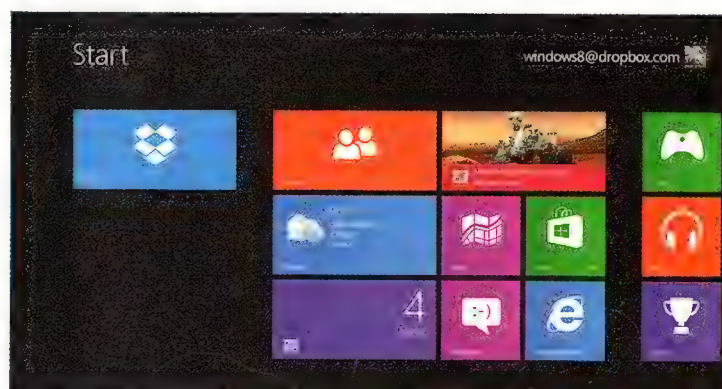
The Windows 8 version of the file storage and sharing app Dropbox just sums up my ongoing frustration with the Windows 8 Store. That nearly four months after launch, the Windows 8 Store is still embarrassingly sparse of desktop-grade applications reworked into the Modern UI interface. I wrote in an earlier column that I missed Dropbox in the Windows Store, even though I also use Microsoft's own excellent SkyDrive, which comes built in to Windows 8. But Dropbox is a better solution than SkyDrive across my other (iOS and Android) devices, so it remains my universal storage.

So Dropbox finally arrives and I immediately install it, expecting the same functionality as the versions on the desktop side of Windows 8 (the traditional PC app). And, of course, surprise surprise, the Windows 8 version is a pretend version. It doesn't give you the file management functionality of the program on the legacy desktop. It's more like a viewer of files you've already uploaded.

You can't upload files, you can't download files, you can't copy or delete or create folders. Instead, the main purpose seems to be viewing and sharing. You can search for files using Windows 8's own search menus, view them, open ones that are editable by Microsoft apps such as Office, and you can share files to other Windows 8 apps. But it's not a fully functional Dropbox.

So what's the point? Why is the Windows 8 Modern UI version crippleware when you can also run Dropbox on the legacy desktop side of Windows 8 and get the full-function product? I get that the Modern UI version is primarily meant for tablets and that the versions on competitor iOS and Android tablets are also not as powerful as the desktop version, but at least on the Android version I can actually export a file and save it to my SD card. I can't even save a file on the Modern UI version of Dropbox in Windows 8 (unless it's a Word or Excel document and I save it from the application itself).

I'll now answer my question: apps designed for Modern UI have to work on a huge variety of mobile devices that simply won't come with the storage and functionality of a desktop PC, so they have to be designed for the lowest common denominator hardware. And we're now back to one of the fundamental complaints about Windows 8: the split personality that allows the Modern UI that's really created for mobile devices onto a desktop PC in the first place. Why force users between two very different interfaces and approaches to computing? Particularly when one of them has touch-oriented navigation and its mobile-oriented apps seem completely at odds with the hardware they run on.

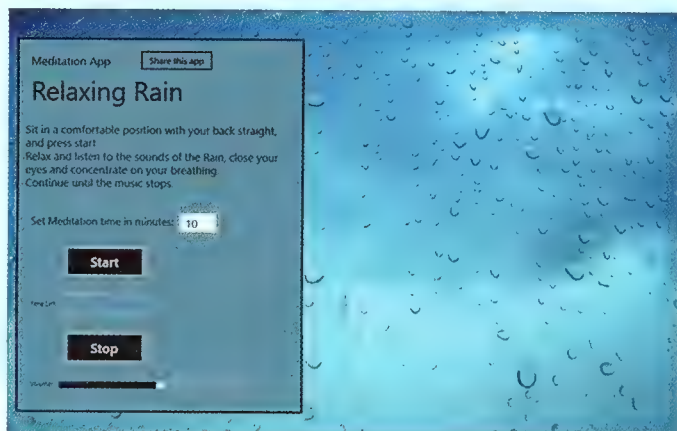


Also, you may have noticed that we've dropped the coverage of Windows apps in this section from an initial two pages to one. This is because, frankly, there are just not enough decent apps each month to warrant two pages. Hopefully we can ramp it back up to two very soon.

Relaxing Rain

Free | Nimrod Popper | tinyurl.com/arxkn8j

This is a really great app to add to your Windows 8 PC for when your blood pressure has gone through the roof thanks to Windows 8's Modern UI or crippleware apps. Relaxing Rain plays the sound of rain, together with relaxing piano music — a great combination to calm down to. But of course, being a Windows 8 Modern UI app, it doesn't play in the background, so it needs to be in the foreground at all times, although you can shove it to the side via the split-screen function.



Mac Store | MACINTOSH

CSR Racing

Drag race your dream car.

Free | NaturalMotion
tinyurl.com/bqbdh9c

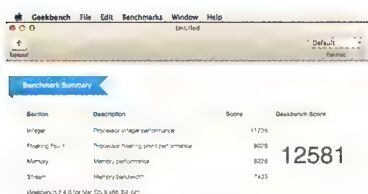


Despite the highly impressive graphics and sound effects, *CSR Racing* isn't an immersive racing experience in the *Gran Turismo* mould. It's a casual game with extremely simple controls, using snazzy effects to draw you into the main game: upgrades.

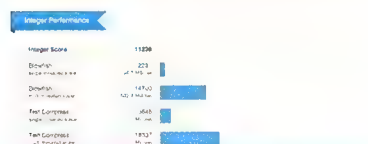
In races, you really only do one thing: hit the gear shift buttons at the right moment to maximise your car's performance in street drag races. There are other tricks as well, such as activating nitrous at the right moment, but basically, this game is about timing your clicks right. It's not a driving simulator.

The real fun comes as you acquire cash for winning races and gold for ranking up, which can then be spent buying better cars and enhancing the ones you've got. You also have the option (naturally) to buy cash and/or gold using real-world money if you're so inclined – and it's not long into the game before you're encouraged to do so.

However, you can get a pretty decent casual play without spending any actual money and the detailed, photorealistic renditions of awesome vehicles are the best thing it's got going for it.



System Information	
Operating System	Mac OS X 10.8.2 (11J223)
Model	Mac10,1 (Mac10,1)
Model ID	Mac10,1
Processor	Apple Inc. Mac OS X (Mac OS X) 1.0 (Mac OS X)
Processor	Apple Core i7-2630QM (Mac OS X) 1.0 (Mac OS X)
Processor ID	Apple Core i7-2630QM (Mac OS X) 1.0 (Mac OS X)
L1 Instruction Cache	32.0 KB x 4
L1 Data Cache	32.0 KB x 4
L2 Cache	256.0 KB x 4
L3 Cache	8.0 MB
Memory	16.0 GB (16.0 GB) (Mac OS X) 1.0 (Mac OS X)
GPU	ATI Mobility Radeon HD 6630M (Mac OS X) 1.0 (Mac OS X)



Geekbench

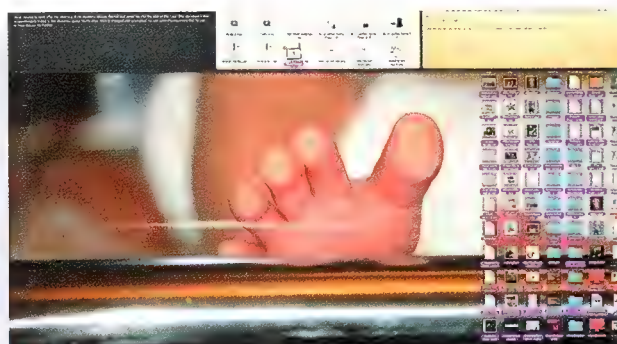
\$13.99 | Primate Labs
tinyurl.com/brvbtwm

If you're the sort of person who likes to tinker a bit with your Mac (and particularly if you're the type who likes to have bragging rights over your tinkering) Geekbench is for you. It's a suite of tests that put your computer's RAM, processor and storage through their paces. Best of all, you can upload your results to compare your Mac against other users. Then when you add a bit of RAM or install an SSD, or in some other way optimise your machine, you can run Geekbench again and see whether it was worth it (hint: RAM is always worth it). Many respected reviewers use Geekbench in their testing of new machines, so you can also use it to see if your existing machine is far enough off the bleeding edge that it's time to upgrade.

Unclutter

Your instant digital pocket for storage.

\$2.99 | Software Ambience Corp.
tinyurl.com/ckvvgkv



I'm a huge fan of cheap utilities that do one thing and do it well, especially when that one thing is so exceedingly useful that you wonder why the OS didn't do it in the first place.

To understand why Unclutter is such a godsend, you have to understand the way OS X treats icons on the desktop. Each and every one of them is basically held in RAM as if it's an open window. That's how QuickLook works and how you can have live updates to image icons and so forth. And since each one is basically an open window, the more you have, the more strain it's putting on your computer. Get rid of them and your computer will be faster and more stable.

At its core, Unclutter is a convenient place

to put those files. Simply drag them to the top of the screen and a drawer will pop down, into which you can drop any file you want (certain files need to be accessible from the desktop and Unclutter is smart enough to create aliases automatically for these). If you need to grab them again, put the mouse at the top of the screen and scroll downwards – thankfully, you can customise the action for opening the drawer, as the default is a bit counter-intuitive.

There's also a clipboard and a notepad, which are nice enough to have I guess, but the core uncluttering functionality makes this a must-have utility. I wouldn't be at all surprised to see Apple 'embrace' it in a future update to OS X.

App Store | iOS

Google Maps

At last, real maps for iOS 6.

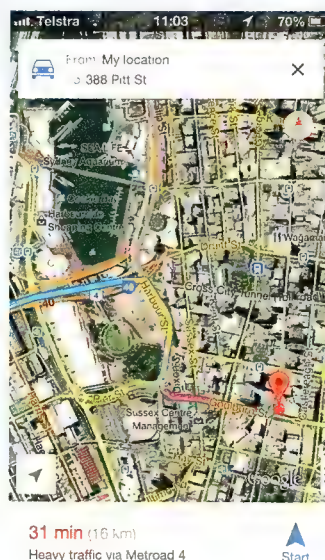
Free | Google, Inc. | tinyurl.com/cqprfmu

There was probably no aspect of the iPhone 5 and its accompanying OS update, iOS 6, that got more attention in the media than the replacement of the old Maps app – which used Google's maps – with a new one using Apple's own map data. The new maps, which Apple had obtained from a variety of sources, had some... let's call them 'issues'. It left people clamouring for the return of the 'old' Maps.

Well, here it is. Google has built its own app based on its own maps, and it's everything you might hope for. Google's been in the mapping business

a lot longer than Apple, so the maps are more mature and less error-prone, though far from error-free. As a bonus, the new Google Maps includes turn-by-turn navigation and voice-guided directions, which the older app didn't.

Of course, Apple's own app also includes turn-by-turn and voice instructions, plus it integrates Siri and the iOS 'Contacts' list. That means you can simply tell your phone "direct me to Joe Bloggs's house" and presuming Mr Bloggs is among your contacts, it will do so. Google Maps can't match that – not yet, at least.



The competition between Apple and Google's free GPS apps is certainly hotting up – I wouldn't want to be trying to sell anyone a \$60+ GPS app for the iPhone right now.

English Country Tune

\$2.99 | increpare
tinyurl.com/dxerlyn

Why this game is called *English Country Tune* is anyone's guess. My theory is that it's so the icon can be labelled ECT and imply that this is going to have a similar effect on your mental state as electroconvulsive therapy might. It's probably not a bad theory, because it will.

The premise is simple. In a three-dimensional space, you manipulate a square plane and push objects around, trying to achieve certain goals. Your goals differ depending on the 'world' you're in. For instance, in the screenshot below, I'm trying to push the balls ('larva') into the transparent cubes ('incubators'). What you're pushing where changes in different levels, but the concept remains the same.

There's no such thing as gravity – the concepts of 'up' and 'down' are arbitrary, and solely dependent on the plane you're rolling around. Nonetheless, you have to be careful not to let things fall off the 'world' or get stuck in corners where you can't reach them. It's maddening, in a genius sort of way.

While it's available on both Windows and Mac, *English Country Tune* is a game that was born for a touchscreen interface.

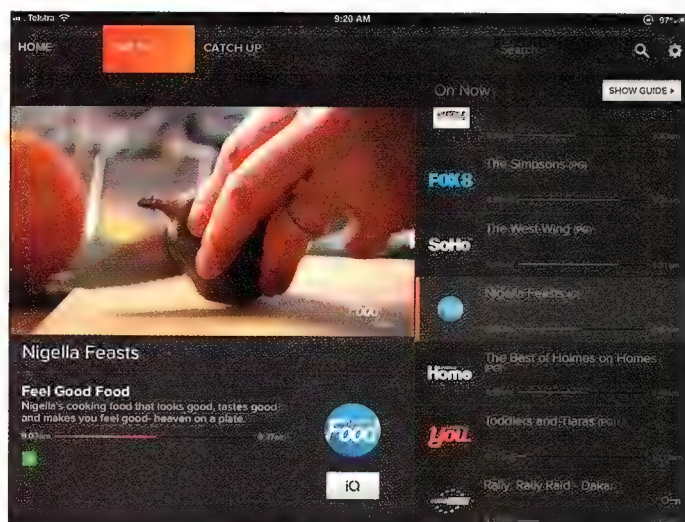
Foxtel Go

Mobile TV?
Yes please.

Free | Foxtel Management Pty Ltd
tinyurl.com/cvvhv9

If you're a Foxtel or Austar subscriber and an iPad user, you probably already have the Foxtel Guide app for your iPad. Foxtel Go takes that a step further, allowing you to watch certain channels live from wherever you are over either Wi-Fi or 3G/4G. You can also watch certain programs iView-style using 'Catch Up'.

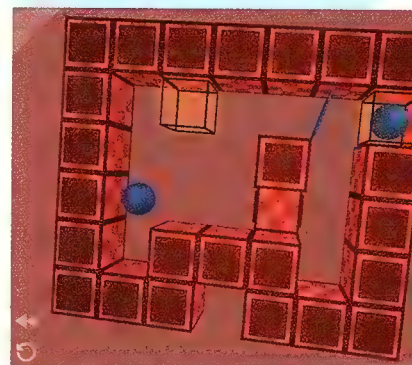
Unlike the Foxtel Mobile app for iPhone, Foxtel Go doesn't require a separate subscription. If a channel in your subscription package is available on Go, you can watch it wherever you are



(great for people on the go). You can also use the app just like the Foxtel Guide app to search for programs and even set your Foxtel iQ unit to record things at home.

Right now the selection of channels is fairly limited, though not bad, and Foxtel

promises more are coming online soon. Hopefully there will also be deals with Telstra (as there are with Foxtel Mobile) so that content is unmetered. Over 3G/4G Foxtel Go eats up 280MB per hour, so your 2GB data plan for the month is looking a little anaemic.





Google Play | ANDROID

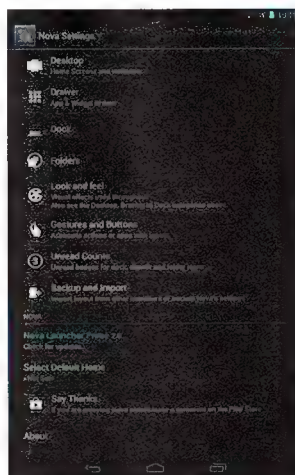
Nova Launcher Prime

A highly customisable replacement launcher.

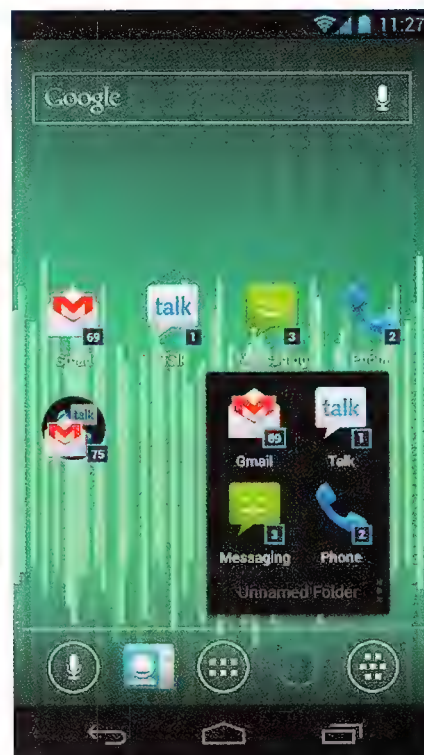
Free/\$4 for Prime | TeslaCoil Software
| tinyurl.com/6nc528q

Replacing a launcher is the easiest way to gain extra functionality from your handset or tablet, without having to go down the path of rooting and/or loading a custom ROM. Nova Launcher (Prime denotes the paid version) is one of the better ones and is in constant battle with Apex Launcher for the coveted position of 'launcher of choice' on my devices.

Why does this launcher capture my heart? I'm the kinda guy who enjoys a good bit of customisation and Nova offers more than you could hope for. If you like custom themes, Nova Launcher supports icon themes made for ADW Launcher and Go, and you can even change the default blue system colour to one better matched to your theme. Folder icons are also replaceable and you can select how many icons you wish to fit on each home screen.



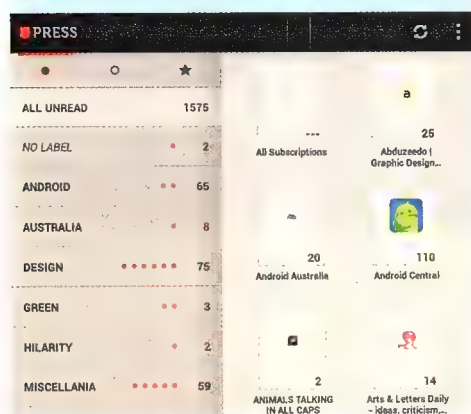
Nova Launcher also includes a scrollable dock down the bottom of the home screen and Prime users can also assign swipe actions to any dock icon. Speaking of gestures, you can pinch, swipe, two-finger swipe, or rotate anywhere on the home screen to launch a Nova Launcher action or app of your choice.



Press

\$1.90 (introductory) | TwentyFive Squares | tinyurl.com/bt56wks

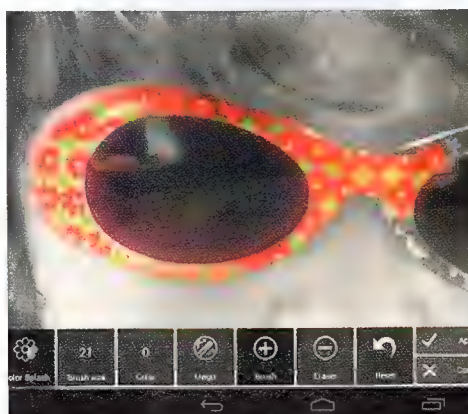
The most immediate feature of Press is its good looks – despite being an Android exclusive, it looks like it could be showcased on an iPhone commercial. You can share out articles using the Android 'Share' menu, so it therefore supports every service imaginable, and the few gripes I have (no swiping between articles) are forgivable, given its brand-spanking-new status. Well worth a look-see.



Pixlr Express

Free | Autodesk Inc | tinyurl.com/d5oub9y

Camera Zoom FX is dead to me. Instagram doesn't cut it anymore. This is now my favourite photo editing app. Pixlr Express offers a mind-bogglingly huge number (over 600) of filters, frames and overlays, as well as the ability to adjust, crop and otherwise fix your photos, and it ties them all together in a simple, logical, unobtrusive interface, which includes 'favourite' effects for quick access. All of this for free? Irresistible.

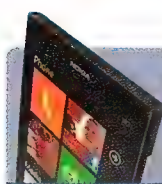


Solid Explorer

\$1.92 | Krzysztof Głodowski | tinyurl.com/cvbt9a

I've been using ES File Explorer for years, but recently switched to Astro because of its attractive interface. However, there were a few features in ES that prevented me from uninstalling it. Now, Solid Explorer gives me everything I need within an attractive and functional two-paneled interface, backed by great usability. You can drag and drop files between directories on your device to other PCs on your network or even to the cloud.





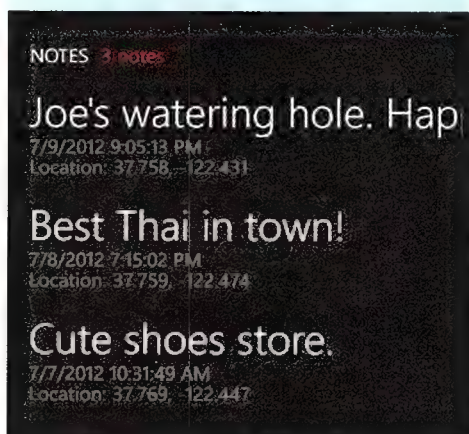
Windows Store

WIN PHONE 8

Notes

Free (ad-free available) | Interprone
tinyurl.com/aw53mya

Windows Phone launched without a note-taking app. Now with Notes, you get the note-taking functionality (albeit without formatting) and the notes are stored with a GPS location of where they were created on a map – handy when you're noting the location of something rad; less handy when you have a fillion notes all geolocated at your house.



SuperTimer

99c | Giovanni Brienza | tinyurl.com/at4l42d

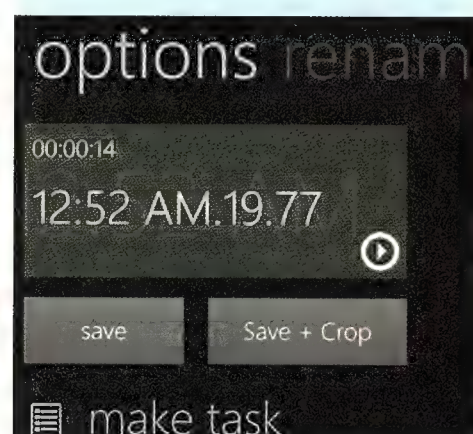
From optimising the steeping time of your tea to making sure your steaks are flipped before they burn, a good timer is a useful thing to have. You can also use SuperTimer as a stopwatch and your timers will run in the background when you have to leave the app. Handily, a Live Tile can give you a quick way to start a timer and you can run three timers at the same time. Woah!



Pocket Recorder

Free | Xochl LLC | tinyurl.com/b2qc2ak

I use Pocket Recorder mainly to record any interviews I conduct. As well as audio editing, the app syncs with the cloud or with your PC over USB and the SyncServer software. Sounds can also be geotagged, compressed to WMA format, or set as an audible reminder or ringtone. It cleverly minimises battery consumption while recording, by dimming the screen and displaying only static UI elements.



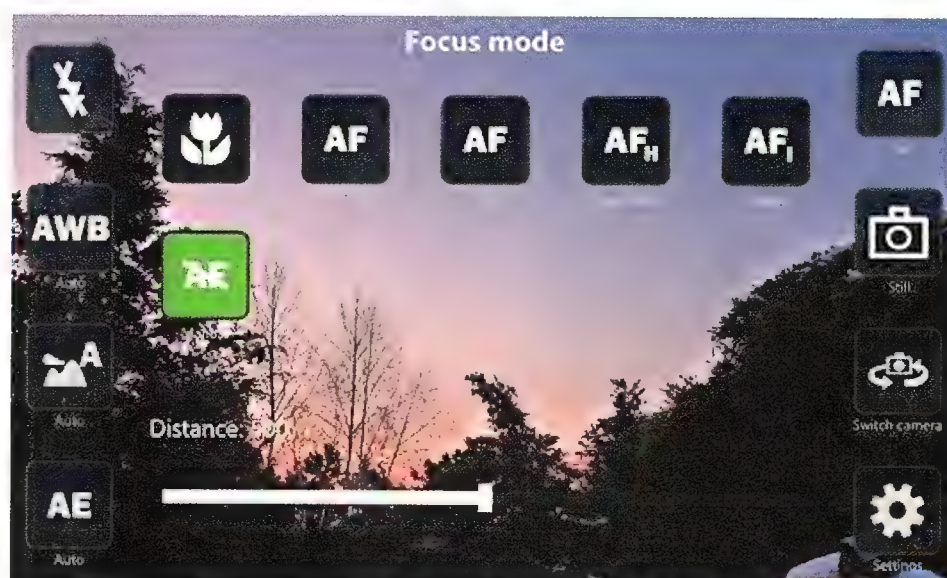
CameraPro

More options than you can shake a shutter at.

\$2.99 | teq-IT | tinyurl.com/ayhqvka

CameraPro is a replacement camera app for Windows Phone 8 that allows you to put your preferred camera options on the shooting screen, where they can be quickly accessed, rather than having them hidden away in the three dot-menu.

It does more than this, however, as it also opens up a heap of options not available in the default camera app. The complete list of available options includes white balance, scenes, exposure time, focus mode (and a focus slider, when set to manual), camera mode, ISO, exposure compensation, image resolution, aspect ratio, self-timer, burst rate, flash, time-lapse, bracketing (handy for HDR photos) and zoom, with some dependent on which device you're using.



You can also display an onscreen grid pattern, a level meter or compass. With all of these handy options, it's the closest your handset has ever been to a digital point-and-click camera.

The best part about it all is that you can

choose which settings you want to appear on the shooting screen, as well as where they sit. Just be sure not to remove the 'Settings' button from the main screen, as you won't be able to access them again without uninstalling and reinstalling the app.



App World | BLACKBERRY

PicMix

An Instagram clone with myriad options.

Free | Inovidea Magna Global
| tinyurl.com/aw26xgh

The popularity of Instagram has led to a multitude of similar photo editing and sharing apps on every single mobile platform. One of the better ones to appear on BlackBerry is PicMix. In fact, it's even a little better than Instagram, in that it supports a few extra features that I really like.

Namely, the ability to create photo collages. You can either pick from the many included layouts or create your own custom one. Of course, you can also touch up your images and/or apply effects, text or a gaudy frame.

Like Instagram, you're meant to share your photo to the PicMix social network (although you can also share it out to BBM, Twitter, Facebook, Google+ or Flickr) and are encouraged to follow other users. In fact, the only way to remove the 'PicMix' watermark



from your photos is to get five people following you, follow 10 others, leave a five-star review and follow PicMix on Twitter/Facebook. In truth, I disagree with this practice, especially the review part, and recommend giving a low

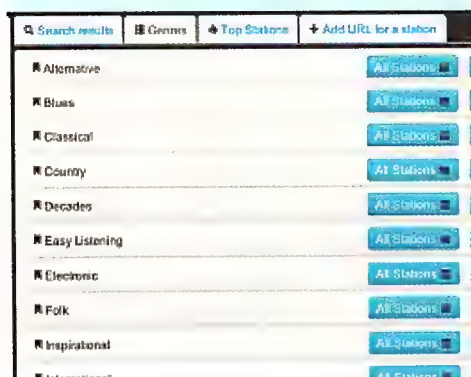
review score to let the developers know this.

The developers are doing their best to grow the network, but the content is severely lacking right now. Still, the features make this app worth a look.

Radio Player

US\$2.99 | Andrei Avram | tinyurl.com/bepnnoy

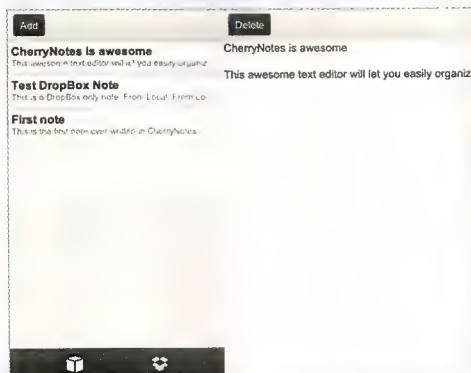
Rather unsurprisingly, Radio Player allows you to listen to any of 60,000 radio stations from across the world. You can browse by genre or subgenre (for example, 'Seasonal & Holiday > Birthday'), search for a station by its name, or even search for a particular song or artist that you wish to hear, and tune to a station that's currently playing it. The app includes lifetime updates and works on both the PlayBook and BlackBerry 10 devices.



CherryNotes

US\$99c | Nathan Campos
| tinyurl.com/auag4jq

CherryNotes is a simple text editor that allows you to choose which of your notes gets synced with the cloud; that is, Dropbox. The simple interface makes creating notes a breeze and not having to upload them to the cloud is especially handy for, say, jotting down some info while you're talking on the phone, or some other note that has no need to make its way to the cloud. It's a fairly new release by a small developer, designed for both the PlayBook and BlackBerry 10.



PlayStation Emulator for PlayBook

Free | CatalystG | tinyurl.com/ca4medr

A lot has happened since the release of the original PlayStation console, and it's now possible to play its games in the palm of your hand. The impossibly named PCSX-ReARMed-PB allows you to browse and load PlayStation .BIN/.CUE files created from your backed-up games and even allows you to customise the controls to best suit your preferred layout. [APC](#)



Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

WINDOWS

POST-UPGRADE BLUES

Q I upgraded to Windows 8 on my laptop. Can you tell me how to reinstall Windows 7? I tried restoring the system from Windows 8 but didn't have any luck. Is there a way to use my recovery discs or will I need to purchase a copy of Windows 7?

Michael De Matteis

A If the recovery discs are the ones that came with your laptop, you should be able to use them to reinstall Windows 7 (provided that's what your laptop shipped with). Your product key should still be on the sticker on the bottom of your laptop. If not, you can download the Windows 7 ISO that corresponds with your licence (tinyurl.com/84urstx) and use that to burn a new install disc. If that doesn't work, due to OEM licensing constraints, contact your laptop manufacturer; they may be able to get you (or sell you) a new recovery disc. Some laptops also have a recovery partition you can boot into to reinstall Windows – when you boot, keep an eye out for any options to press keys to access a recovery feature.

If you want to downgrade because of program incompatibilities, go ahead and downgrade. But if you just miss the 'Start' menu and hate the Modern UI, there's a way to keep the performance improvements of Windows 8 and get the classic 'Start' menu back. Several ways, actually, but we like Start8 (US\$4.99 from www.stardock.com) or Classic Shell (free from classicshell.com).

Classic Shell restores the 'Start' button and menu, and even gives you a choice whether to completely eliminate the 'Start' screen so you can ease into Windows 8.

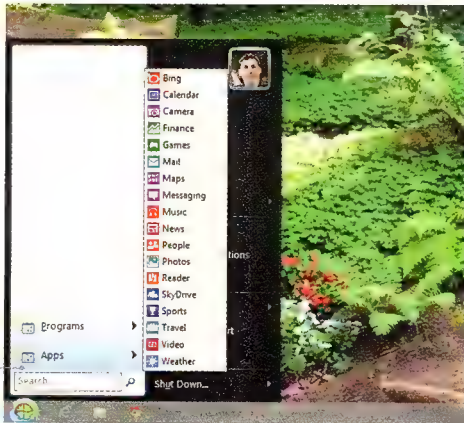
sourceforge.net). Install either one and you can add a 'Start' button back to your taskbar, and even disable the Modern UI entirely. And later, when the Modern UI gets more useful or you feel like experimenting, you can get the Modern UI back without having to downgrade now and upgrade again later.

STORAGE

SSD PROGRAM SORTING

Q I recently upgraded my old computer with (among other things) an SSD. I don't want to fill it up with unnecessary stuff. I've installed Windows 7 and MS Office on it, but have directed downloads, documents, pictures, videos and other documents to default to a secondary hard drive. I'm wondering about programs: if they aren't frequently used, or maybe just a trial program, is it OK performance-wise to put a program on the HDD rather than on the SSD? Would this have any effect on the overall system performance?

Jack Orkin



A In the future, we'll all have enough SSD space to install every program we want, but right now few of us can afford an SSD that big, so some programs invariably have to be installed on mechanical drives. This is perfectly fine. Putting your OS and your most frequently used programs on the SSD is the best way to take advantage of your SSD's access speeds, but there's absolutely nothing wrong with installing less frequently used or trial programs on the HDD. Your instinct is right on the money. They won't load as fast, of course, but who cares? If you wind up using them all the time, make room on the SSD. Otherwise, they're fine where they are.

WINDOWS

SUDDEN COLD SNAP

Q Can you suggest a solution to an annoying random Windows freeze? I started experiencing a couple of months ago on my 18-month-old desktop PC? I'm not aware of anything that would have caused this to start happening (no new software that I can recall, just the normal updates). The PC freezes every few days for no obvious reason; doing general tasks or even left idling, which seems to rule out heat or component stress. If a sound was playing, it continues frozen at its last note, the screen is frozen (no blue screen) and no inputs work. The PC runs cool, the power supply is over-spec'd, a memory test found no problem. Updating the Catalyst driver has failed to make any difference.

Chris Read

A It's almost certainly a driver. Badly written drivers can get stuck in endless loops waiting for a response from some other component. Windows will preemptively terminate most applications that enter this

CONTACT@APCTEST.COM Share your tech tips

Have you solved a tech problem or found a better way of doing things with your computer? Share your information with other APC readers by sending it in as a tip to contact@apctest.com, together with your name

and contact details (details won't be printed). Alternatively, if you have a technical question post it online on our forums at apcmag.com/forums and other readers may be able to solve it.

sort of death spiral but it isn't always possible with low-level drivers. And that's why we have system logs. Sometimes the ordinary Windows event logs are enough.

Immediately after a freeze, reboot and go to the 'Control Panel' and under 'Administrative Tools > Computer Management', you'll find 'Event Viewer' (or in Windows 8, just search for 'event' on the Charms bar). Look through the lists there for the last thing that was running when the PC froze. There'll be lots of red herrings, and it can take a fair bit of patient googling to hone in on the suspect, but it's probably in there somewhere.

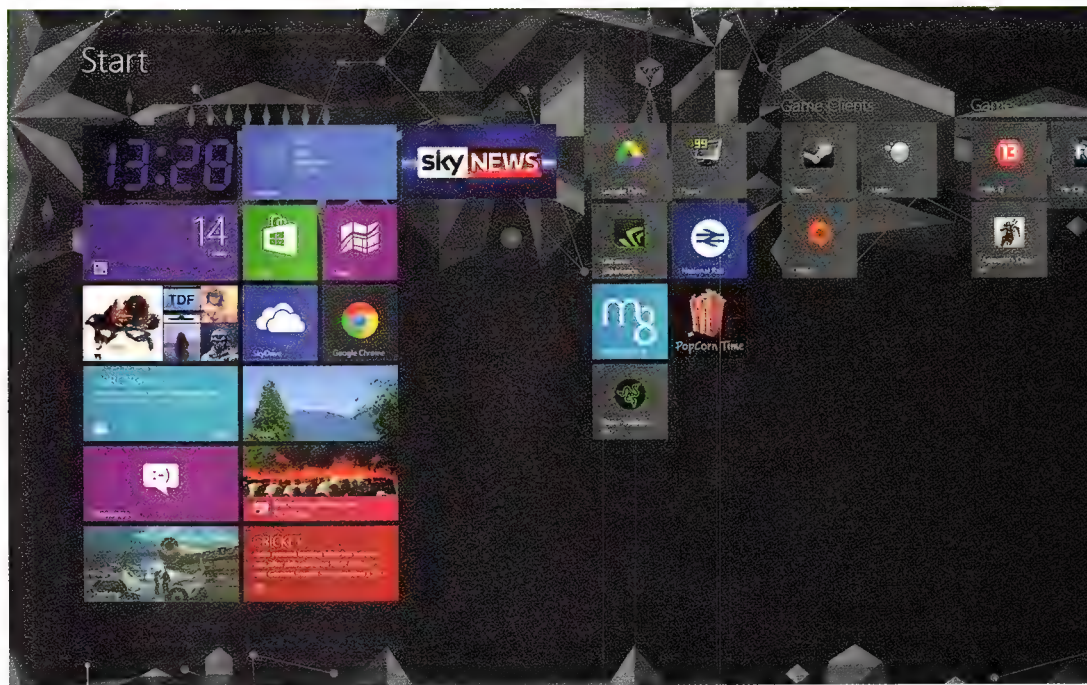
Alternatively, you can use the Windows Performance Analysis Tools (WPT) to try and find a device or process that's hogging all the CPU's attention. You can download this from MSDN (tinyurl.com/ab4eokw) but it's a heavy-duty tool and making sense of the information it records is no small feat.

Look, we'll level with you: hunting for buggy drivers is very slow and very boring. There'll be times when you'll feel like giving up and just buying a new motherboard or reformatting and reinstalling Windows. These actions, though born of despair, may actually appear to fix the problem for a while, because you're churning up the soil enough that your buggy driver might be buried or replaced in the process. But I'd counsel against this, nonetheless. You won't find out the cause of your problem and when it eventually resurfaces, you'll be no better off. You can't buy a new motherboard every time your PC freezes.

SOFTWARE

BITLOCKER SUCKS!

Q I recently bought a 1.5TB external hard drive and decided to encrypt it with BitLocker. When I plugged it into my Blu-ray player's USB, it didn't detect it. So I decided to decrypt it again. About 10% of the way through, it said I should run 'chkdsk /r', so I did. It continued through the night and the next morning, I found that the computer had frozen at 94.3%, because it didn't respond. When I rebooted, it only showed the icon of the HDD, with no info such as the available space. Double-clicking the HDD freezes the computer,



WINDOWS: Update or downgrade?
That is the question.

until I power off the external HDD. I tried it on other computers with no success.

In a moment of insanity I plugged it into my old XP laptop and formatted it. I thought I was free from BitLocker's evil grip, but when I copy something and use more than 60GB, the thing freezes again. I tried CCleaner and Darik's Boot and Nuke to completely wipe it, but it keeps on giving me errors. What can I do? A new HDD will be too expensive.

Ruan Olivier

A The only thing that sucks here is your hard disk, which is broken. Two, you can count on having to buy a new disk.

No-one likes broken hard disks, or the cost of replacing them. Consider this, then: you encrypted a disk; it didn't mount on your PC. BitLocker warns you to run 'chkdsk' because it encountered disk errors during decryption.

'Chkdsk' can't complete because the disk hangs. Reformatting doesn't fix this, neither does completely and securely erasing the disk with two separate secure erase utilities. In fact, the only thing that helps is cycling the power on the disk drive. Not the PC, the disk drive. This problem is definitely not software related.

We do have some good news, though. There are two words in your letter that are throwing you a lifeline and they come almost at the very start: 'recently bought'. In other words, you should be still under warranty; a warranty you should now claim! When you take your disk back, we advise you to avoid any mention of BitLocker at all. Partly because

it'll only confuse matters, but mainly because it has nothing to do with the drive failure.

WINDOWS

RECYCLING WINDOWS 8

Q I was planning to buy a new PC when Windows 8 came out but in the end I didn't have enough money saved. So I got impatient and upgraded my old Windows 7 machine to bask in the loveliness of the Modern UI Live Tiles. Now I have almost enough for my new machine and I'm wondering if I can save some money by downgrading my old PC back to Windows 7 and then using my copy of Windows 8 on the new PC to save buying a whole new copy. Is this possible? Is it legal?

Jezz

A Legal? Yes. Possible? Probably. Cheaper? I don't think so. Your Win8 copy is an upgrade licence. When you downloaded Windows 8 via the upgrade assistant, you had the option to create an .ISO file and burn this to disc.

If you did this, you could use it to upgrade your new PC, but Windows 8 won't pass the activation stage unless it detects some remnants of the previous version. You could ring up and activate over the phone, and they might allow it. But your original Windows 7 licence would then be deactivated.

You won't be able to keep both licences running, since one has upgraded the other. If you don't care about the old PC having a copy of Windows then it doesn't matter. If you do, it will be cheaper to simply get the new PC with an OEM copy of Windows 7 preinstalled on the disk and then upgrade it to Windows 8. **ENDS**

Taming the tickless timer

Your system's timer could be more of a foe than a friend. **Ashton Mills** helps you decide which timer to switch to, based on your needs.

YOU'LL NEED THIS

A WINDOWS PC

These timing tips and tweaks are all based around a Windows PC set up.

We've previously covered the nature of timers in Windows (see APC February 2012, page 90, 'Stutter-free streaming'), including how your system's timer can impact multimedia playback, streaming, games and all manner of audio and video creation that often relies on accurate timing. Problems that can occur can include audio pops and crackling, synchronisation issues with streaming and video playback, micro-stuttering in games (especially with SLI/CrossFire users), problems with drivers, and clock drift.

These arise out of the nature of system timers themselves, which are hardware-based counters that are designed to provide a regular timed interval (known as a 'tick') through which the operating system kernel can synchronise shuffling data around, respond to device interrupts, and service the programs you run.

Modern PCs have a number of sources that can be used to do this:

- **RTC** – The Real Time Clock is the battery-backed clock source that keeps track of time when your PC is off. It can be used as a timer source, but has limited functionality and low resolution.
- **PIT** – The Programmable Interrupt Timer has been around since the first IBM PC and provides a slow, low resolution (higher than RTC) but reliable basic counter which can be used as a timer.
- **TSC** – The Time Stamp Counter is internal to the CPU and very fast to access. This makes it attractive for real-time tasks and was happily the de facto choice before advances such as multicore CPUs and power-saving technologies, both of which can affect the accuracy of the timer. Power-saving modes can reduce CPU core frequencies which in turn changes the speed at which the timer

increments, for example, while multicore CPUs don't guarantee synchronised TSCs between each CPU core.

- **LAPIC** – The Local Advanced Programmable Interrupt Controller timer is based off the CPU's bus speed and designed to help manage interrupts for multiple CPUs, but has a low resolution and suffers from similar problems as the TSC if CPU bus (again from power-saving modes) or core speeds should change.
- **ACPI PM** – The Advanced Configuration and Power Interface Power Management timer (that's a mouthful!) is similar to the TSC but isn't affected by CPU speed or other power management technologies, and is thus usually preferable, but is slower to access than the TSC.
- **HPET** – The High Precision Event Timer was designed to address the shortcomings of all of the above timers, with both a high resolution and accuracy independent of processor speeds or power-saving modes, and more flexibility and features in how timers are accessed. The High Precision Event Timer is also faster than the ACPI PM timer, but still slower than the TSC.

Since Vista, Windows by default appears to use a combination of the TSC and ACPI PM timers, which isn't uncommon (programmers wanting to use the TSC for its high resolution can mitigate its shortcomings by regularly calibrating it using the PIT, for example). It does this even if HPET is available, as it's still only a reasonably recent innovation (though any PC purchased in the last few years should support it).

However, Windows can be told to use the HPET exclusively, which may help solve timer-related issues like those we've mentioned above. Indeed, during development the HPET was originally called the Multimedia Timer – so if audio, video and games are your thing, it's not a bad idea to switch to it.

This can be done by opening an elevated (administrator) command prompt in Windows and running:

```
bcdedit /set useplatformclock true
```

And then rebooting. This only has to be done once. You also need to make sure HPET is enabled in your system's BIOS (if your PC supports HPET, it will usually have an option to enable or disable it in the BIOS).

This was all well and good up until Windows 7, but something funny happened with Windows 8. The software used to measure the latency of timers often reported unusually long delays, large enough to impact multimedia. At the same time users started reporting having Windows 8 'freeze' up on them if leaving the machine idle, such that Microsoft responded with the fix we'll detail in a moment.

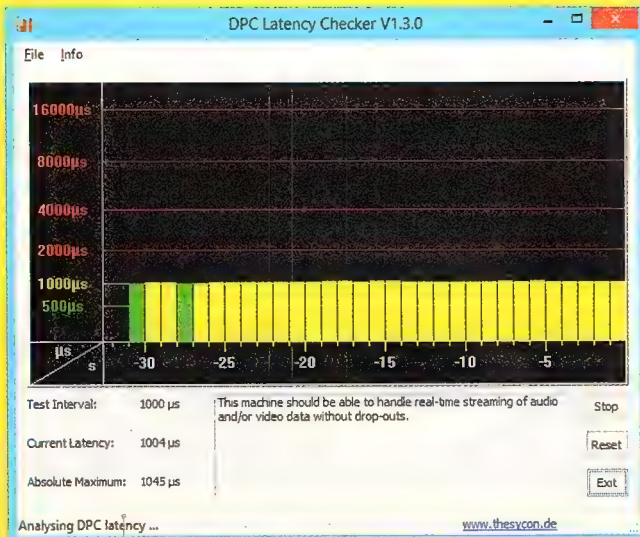
The problem, it turned out, was with a new way that Windows 8 makes use of timers. By default, timers are used to schedule and trigger interrupts for the CPU to get things done. Even if the CPU isn't particularly busy, regular interrupts occur to ensure everything else in the system

MEASURING TIMER LATENCY

One of the more popular tools to visually see the effect of different timers and their latency is the DPC Latency Checker (www.thesycon.de/deu/latency_check.shtml). DPCs are Deferred Procedure Calls, and Windows' way of ensuring that every device issuing an interrupt gets its fair turn on the CPU by putting them into a queue to be serviced at the first available opportunity.

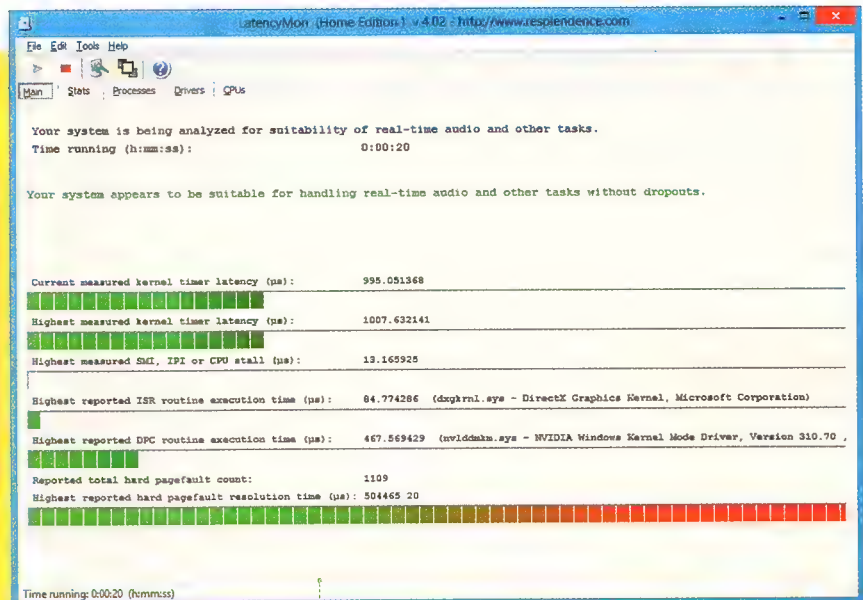
If a device hogs its limelight too long however, it can impact other devices such as a network device driver causing your audio card to wait too long and thus dropping sound. The DPC Latency checker will show the maximum time devices have to wait, a function of the system timer being used.

While DPC Latency Checker works fine on Windows 7, it's not yet updated to handle dynamic ticks with Windows 8 and thus isn't recommended for measuring latencies on Windows 8. Instead an alternative tool, LatencyMon (www.resplendence.com/latencymon), is recommended. LatencyMon will also show the maximum timer latency incurred, as well as which drivers are responsible for high DPC latencies.



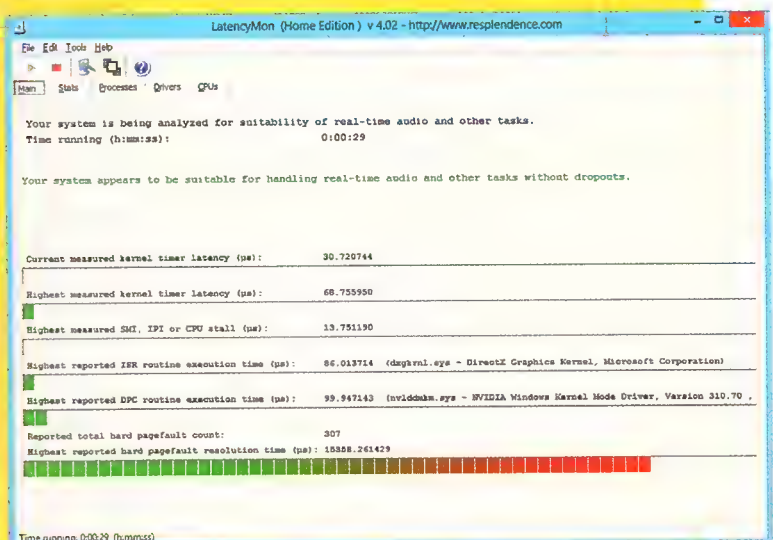
DPC Latency works well for Windows 7, but shouldn't be used as a guide for Windows 8 until the next update.

Most modern PCs will have an option to enable HPET in the BIOS.



Measuring maximum latencies with LatencyMon in Windows 8 with dynamic ticks.

And after disabling dynamic ticks.



operates smoothly (including, of course, Windows itself). And for an interrupt to be addressed, the CPU has to 'wake up' even if it's in an idle or low-power state.

With Microsoft's focus on the mobile platform, especially tablets, saving power to ensure longer battery life in Windows 8 became paramount. And given CPUs generally spend an awful lot of time doing nothing (browsing, email, et al aren't exactly heavy tasks), Windows 8 implements what's known as 'dynamic ticks' (also known as a 'tickless') to queue interrupts and wake up the CPU to service them only when something needs to get done. The result is a tiny saving in power that, over time, adds up and helps to extend battery life.

This is great for tablets, laptops and other portable devices. But is

it necessary on a desktop? The power saving is negligible on the large power draws desktops have, and the side effects like the aforementioned freezing issue and possible impacts on timer latency mean it should be your first stop if you're having problems after upgrading to Windows 8.

Fortunately, you can also disable dynamic ticks through the use of the `bcdedit` command like so:

`bcdedit /set disabledynamictick true`

This effectively restores behaviour to that of Windows 7. Between this and enabling the use of HPET, any timer-related issues should be solved. Naturally, if you need to you can undo the changes by simply issuing the above commands again using 'false' instead of 'true'. **ETC**

Steam for Linux arrives

First there was Windows, then Mac — now, Valve has released a native Steam client for Linux. The world will never be the same. [Ashton Mills](#) explains.

YOU'LL NEED THIS

STEAM LINUX BETA

Download it at store.steampowered.com/about.

UBUNTU 12.04

Beta is designed primarily for the previous version (we used Ubuntu 12.10 though). Get it from www.ubuntu.com/download.

When Valve released the Mac client for Steam some years ago, I said then that the Linux client was inevitable. Not because as the third major platform of choice for personal computing today it would simply be ticking another box, but because Mac OS X is Unix-based, and so a port to Linux wouldn't conceivably be hard.

Of course, there's no point porting the client to Linux unless there's a monetary incentive. Valve, great as it is and a pioneer in the industry as both a developer and a distributor, is primarily a business. As much as Linux users all over the world would love more native games — especially the latest triple-A titles — previous experience has shown that Linux users don't like to pay for games. Case in point: Loki Entertainment Software, a company that spent years porting 20 mainstream titles (including *Civilisation: Call to Power*, *Heroes of Might and Magic III* and *Tribes 2*) from Windows to Linux, but eventually went under because it failed to make a profit. Loki closed its doors 10 years ago.

Which is, oddly, in direct contrast to the Humble Indie Bundle offers we've seen in the last few years — if you haven't heard of the Humble Indie Bundles, head to www.humblebundle.com. New bundles are released regularly, where you can pay as much for the games on offer as you wish — \$1, \$10, \$1,000 — it's really up to you. Some of the money goes to the game developers and some goes to charity. In every bundle run so far that included games with Linux ports, Linux users paid more on average for games than both Windows and Mac users, sometimes combined.

Perhaps times have changed, or the notion of paying for software while running a free operating system is much more mainstream.

But I digress. Valve wouldn't jump in unless it had a monetary incentive, and that incentive funnily enough isn't Linux gamers — it's Windows ones.

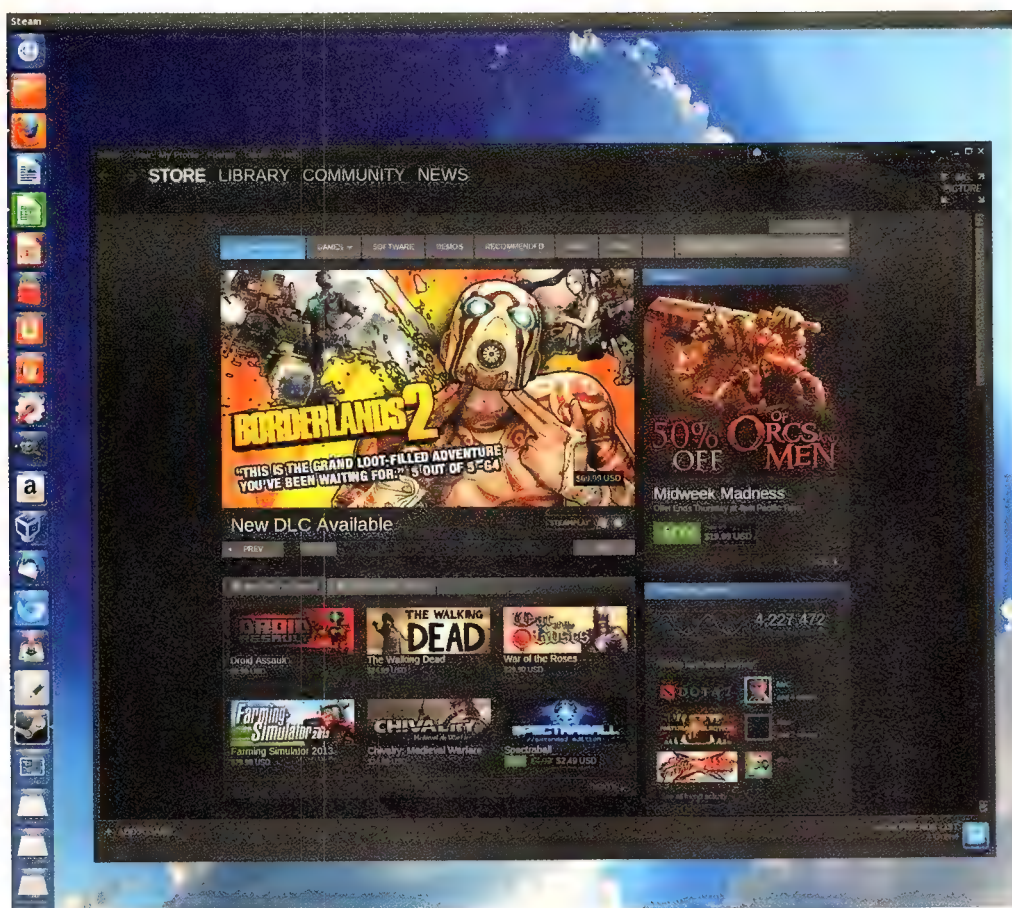
How so? Because not only did Valve recently take the native Steam Linux client out of closed Beta to public Beta, it also confirmed rumours at the recent CES that it wanted to take on a hardware role — specifically, the Steam Box.

While no hardware partners have been confirmed — and indeed Valve is looking to let anyone make a Steam Box (think for example an ASUS Steam Box, much like you might buy an ASUS Nvidia card) — the company has its sights on a lounge room entertainment console. Something that at first glance would seem to go in direct competition with consoles like Microsoft's Xbox 360.

And why not? Not only does Steam have a huge catalogue of games to play, imagine being able to play games on your PC and then head downstairs to the lounge room, boot up the Steam Box and play those same games.



Steam for Linux, ready to download.



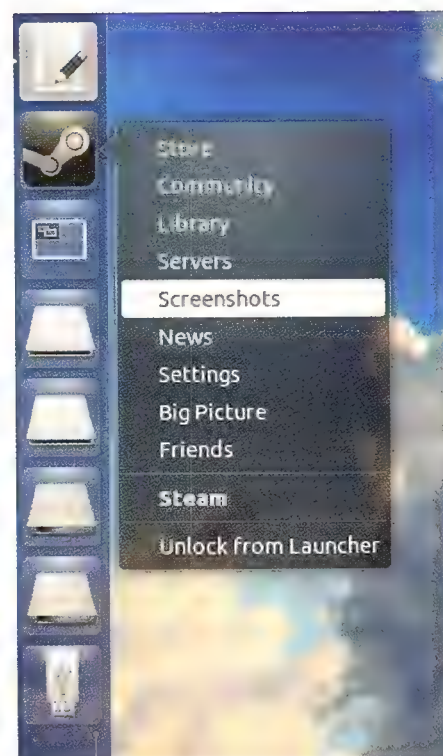
Steam on Linux looks, feels, and acts just the same as on Windows.

And with your saved games, thanks to the Steam Cloud, you'd pick up right where you left off. Or head over to a friend's place, login to their Steam Box and play your games from there.

This naturally ties in to Steam's Big Picture mode – aka console interface – it launched last year. Which brings us back to consoles like the Xbox: why buy an Xbox version of a game when you can buy it through Steam and play it on your PC and via the Steam Box console? Not only does this take a sale away from the Xbox games ecosystem, it can take a sale away from the Xbox itself. One thing's for sure: Microsoft will be watching the development of the Steam Box closely.

So what's the Linux link? Console hardware is expensive enough as it is – Microsoft and Sony sell the Xbox and PlayStation at a loss and instead make up the difference through licensing and game sales. Why add another cost of a Windows licence to a compact lounge room computer when you can use Linux instead, at no cost? Moreover, with source code freely available, Valve can build its own Linux distribution tailored specifically for its Steam service and games. It's kind of a no-brainer when you look at it, but it does depend on one thing: a native Linux Steam client.

The Steam Box is likely a year away or more, but this gives Valve plenty of time to promote Steam on Linux. After all, a native Steam client is not the same as native Linux games, so if we're to see more native Linux games – the type of which the Steam Box could run – you first need to get more developers on board. And this has always been the problem: chicken and egg. While there are native Linux clients for a raft of games, the number is tiny compared to the catalogue available for Windows and, as with the Steam Box itself, there must be a monetary incentive if developers are to release Linux clients. Many developers



Steam integrates with Ubuntu's Unity to provide right-click launcher options for quick access.

TF2 running on Linux, not that you could tell – it's identical to Windows.



say they won't release a Linux client if the market isn't big enough to make a profit, but there can't be a market unless there are games for Linux users to buy.

But you can bet when an industry giant like Valve dips its toes into the penguin pool, every other major developer and publisher in the industry is going to take notice. And when Valve releases a native Linux Steam client – enabling the easy purchase and distribution of games on Linux – it's offering up a new market on a platter to them too. Then you add the Steam Box... and you get the idea. The seeds are being planted. There'll be plenty of money to be made from developers releasing Linux clients for their games. It starts right here, right now. But it's not without its problems.

STANDARDISATION

One of the strengths of Linux has always been its open source nature which in turn sees hundreds of different distributions you can use – some are tailored for desktop use, some for science and industry, some for education and some for entertainment. The choice is wonderful for users – but not for developers. Even on a standard Windows PC where there's just one current version of the operating system, the vast plethora of motherboards, CPUs, video cards, sound cards and more has long seen issues for developers needing to program around the many quirks you get from the innumerable combinations of hardware.

Imagine that, and then add the software component of dozens of different mainstream Linux distributions on top, that all to some degree do things a little differently, let alone using different interfaces to package management. It gets messy. In the words of a Valve developer on the Steam Linux blog, "It's impossible for us to cover all the different configurations."

Already the Steam Linux client Beta comes with caveats: it's designed primarily for Ubuntu 12.04, and yes that's the previous Ubuntu. Posts on the Steam Linux client forums tell of users with other distributions – Fedora, openSUSE, Arch and more – having problems because locations

that are standard under Ubuntu may be slightly different in their compatriots, breaking either Steam or the bundled packages Steam uses to install a game on your system.

So like it or loathe it, Linux's open nature and array of distributions work against it here. If Linux gaming is to take off, it's going to need to standardise on just a handful of distributions, or even just the one – the harder it is to release games on Linux, the greater the barrier of entry to do so.

While Ubuntu is generally the most popular distribution for end users, it wasn't always and it may not be again in the future (certainly Unity appears to have turned away a good portion, for example). It remains to be seen how this evolves, and perhaps we may even see a gaming-centric version of Ubuntu.

But let's get down to business; the Steam client is here, so how's it shaping up?

STEAM FOR LINUX

You can download the Steam Linux Beta at store.steampowered.com/about (or simply click 'Install Steam' from the Steam web page). Using Ubuntu 12.10 64-bit, our experience is as follows.

To its credit it looks and feels exactly like the Windows version in every respect. The only difference we noted was some font differences in a few menus, but those are relatively minor.

Selecting Steam to start automatically at boot works flawlessly, as does Steam auto-updating itself, which is impressive since it's bypassing whatever package management update system you usually use. Also to its credit it makes full use of Unity's launch icon functionality – if you right-click, you get a jump list, similar to that found on Windows, for the taskbar icon.

Features such as chat work as expected, as do pop-up notifications both on the Ubuntu desktop and in-game. Interestingly, you can use the Print Screen key with Source – which normally takes a shot of the Ubuntu desktop – to screen cap games, too. Finally, you can Alt+Tab in and out of a game and the desktop, just as with Windows.

We used Unigine's Heaven for our testing to see how a synthetic benchmark compared.

Heaven tests modern features like tessellation, which work in DirectX and OpenGL.



The Steam icon that would normally sit in the GNOME indicator bar however, correlating to the Windows taskbar one, doesn't work in 64-bit Ubuntu at the moment. Valve is aware of the issue. Flash, which is required to watch videos in Steam, also doesn't work at the moment though this is a regression from closed Beta versions, and will be fixed in a future update.

At the time of writing there are some 61 games released through Steam for Linux. However the site steamlinux.flibitijibibo.com, which keeps track of games released on Steam, shows there are another 30 or so games with Linux clients currently going through the Steam release process, and another 50 games which so far don't have a Steam status but are native Linux none the less.

Of course, an important question for gaming on Linux is how well do games run? Over the years there have been various comparisons (especially using Id Software's *Quake* series) that have shown Linux to be ahead or behind Windows for any given game. But times have changed, and with the release of Unity for Ubuntu – which has had some reports of it slowing down games – we naturally had to test this.

BENCHMARKING

Valve's own benchmarks for *Left 4 Dead 2*, in a post made on its blog in August of last year, revealed it had the game running at 315fps under Linux compared to 270fps under Windows, a nice lead of 45fps. Obviously most systems are capped at 60fps (unless you have a 120Hz monitor!) but it's a useful metric to represent throughput, should a game be more demanding (looking at you, *Crysis* series).

Left 4 Dead 2 isn't officially available yet, but *Team Fortress 2* is, and they use the same underlying Valve Source engine. Additionally, we wanted to see how a synthetic benchmark compared, so we've used Unigine's Heaven, which is available for Windows, Mac OS X and Linux.

The hardware for our test is an Intel Core i7 3970X, 16GB RAM and Nvidia GTX 680. Benchmarks were averaged over three runs.

For Heaven we ran at a typical monitor configuration of 1,920 x 1,080 with 2xAA, 16xAF, Shaders high and Normal tessellation. For *TF2* we ran with a more demanding 2,560 x 1,600, 8xMSAA, 16xAF and all other settings maximised. We created a custom time demo to benchmark.

THE RESULTS

Heaven is unique in that it allows us to test both DirectX 11 and OpenGL for Windows and compare to Linux OpenGL. Here, Heaven saw Linux take the lead with an average frame rate of 74 to Windows' 64 in OpenGL. It also sported slightly higher minimum frame rate and a wide margin on the maximum frames (around 30fps).

Nice, but there are few OpenGL-based games on Windows these days – DirectX is the standard. Impressively OpenGL on Linux matches DX11: Windows had a slightly higher average (80 to 74), but Linux had both a higher minimum again with a lead of 7 frames and higher maximum, also around 30fps faster. The minimum is again an important value, because lower frame rates are more jarring to smooth gameplay, but the average is also important to maintain a decent fps. It's fair to say that here, Windows and Linux are equal.

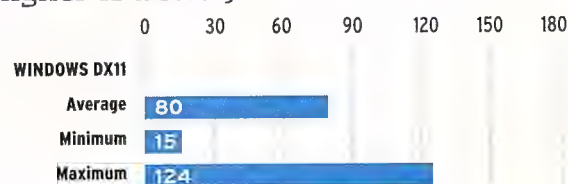
TF2 results are similarly close – here Windows in DirectX 9 (the Source engine is DX9-based) outperforms Linux by 15fps on average, however the variability reported showed less fluctuation under Linux than Windows (maximum deviation 33fps compared to 52).

One could say this isn't apples to apples comparing DirectX to OpenGL as they're different frameworks, and this would be true. However as DirectX is Windows-only, and Linux is OpenGL-only, it's the only basis on which to compare them. And from this perspective, it seems Linux is at least as good as Windows for playing games.

One other comment stands out from Valve's blog post about *Left 4 Dead 2* performance – in it the team noted that their performance gains were a result of just starting now to optimise Source for Linux and working with hardware vendors like Nvidia for driver optimisation, while Windows has had over a decade of development behind it. If this is what we have now with baby steps in Linux, it's entirely possible Linux could not just match Windows for performance as it does now, but overtake it. And with games becoming ever more demanding, if switching to Linux could net you a 10-20% performance boost, we may well see a new migration of Linux users – Windows gamers. [BLOG](#)

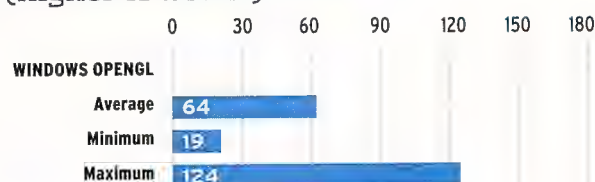
UNIGINE HEAVEN

Gaming benchmarks
(higher is better)



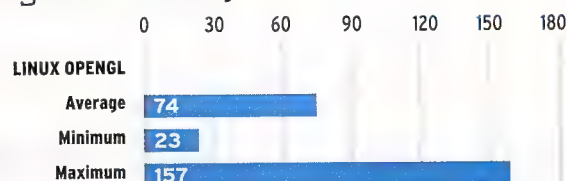
UNIGINE HEAVEN

Gaming benchmarks
(higher is better)



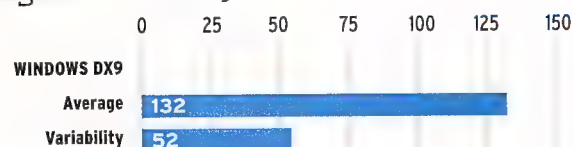
UNIGINE HEAVEN

Gaming benchmarks
(higher is better)



TEAM FORTRESS 2

Gaming benchmarks
(higher is better)



TEAM FORTRESS 2

Gaming benchmarks
(higher is better)



Automate your backups

Automated backups are the best way to keep your data safe.

Simon Chester explains how to set them up.

YOU'LL NEED THIS

DROPSYNC PRO

Get the app from the Google Play store at tinyurl.com/c9nshus.

TITANIUM BACKUP PRO

Available for \$6.49 at tinyurl.com/d5p3cqv.

Backing up is that task that every geek *knows* they should do, but like shaving their neck, don't do as often as they should. With so many precious things now stored on your handset (I'm talking game progress as well as photos here), it's more than just a dollar cost when you leave your phone in the back of a taxi.

Thankfully, you can take at least some of the sting out of this loss if you follow a few simple steps to make sure your backups are always current and stored somewhere safe – i.e. the cloud. There are two types of data you'll want to back up: your user data (mainly photos) and your app data. The user data is easiest, so I'll start with that.

BACK UP PHOTOS & FILES

Photos are probably the most important data on your phone (they are, after all, irreplaceable), but there can also be other things that will be a pain to replace, such as ebooks, custom ringtones and icons, and so on. The native Dropbox app supports the auto upload of photos, but for this other data, it won't really help.

As such, I use Dropsync Pro, which is an unofficial Dropbox client that provides functionality more like the desktop Dropbox client – that is, full two-way instant sync of files between selected folders on your handset and Dropbox (I should note that you don't have to do two-way, if you don't want to).

Once installed (I recommend the Pro over the free, as it supports multiple folders), you need to log into your Dropbox

account and select which folders you want to sync. So let's take a visit to the 'Settings' menu.

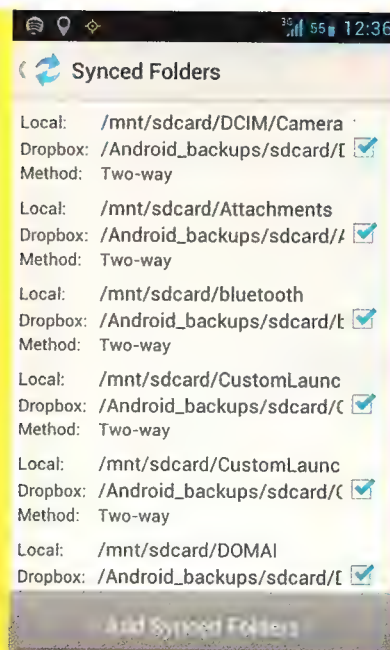
The first item in the list is where you choose which folders to sync. You first select a folder on your handset (for photos, it's usually DCIM/Camera/) and then choose or create a corresponding folder in Dropbox (Android Backups/DCIM/Camera for instance). You can then select whether you want the sync to be two-way, upload only, upload and then delete, upload mirror, download only, download and then delete, or download mirror. I do full two-way, so that I can edit images on my PC, and have them appear on my handset, but YMMV.

You may also want to add your Instagram folder or other photo editing app folders, as well as any other precious data.

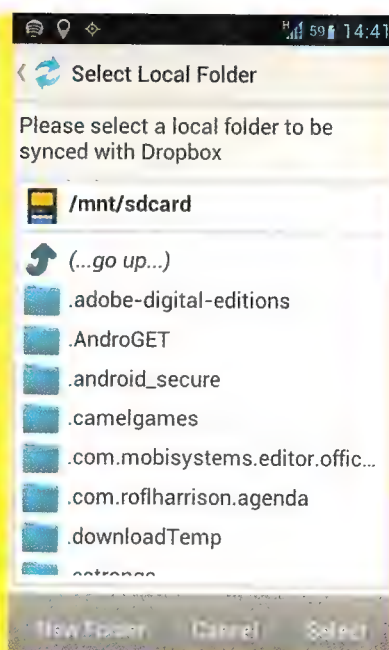
The 'Exclude Name Patterns' menu is a handy menu, as it enables you to choose specific file types that won't be uploaded, using wildcards. I recommend excluding any thumbnails by adding:

```
**/DCIM/**/cache
**/.thumbnails
**/Thumbs.db
```

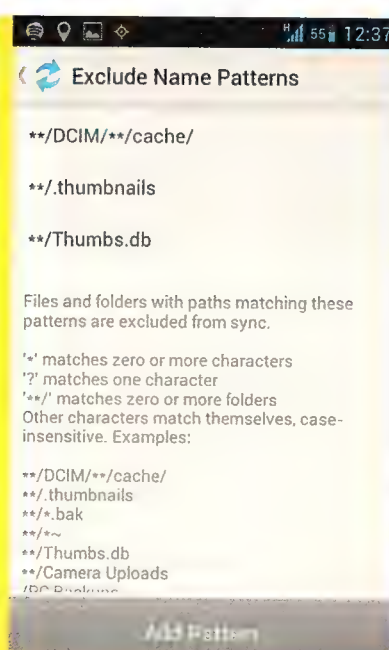
The rest of the options are fairly self-explanatory. I have 'Autosync' turned off, but since Dropsync includes a Locale/Tasker plug-in, I've set up Locale to turn on 'Autosync' while my phone is charging at night. This way I don't eat up my data quota (I'm usually connected to Wi-Fi) and I get a chance to delete any less-than-stellar photos before they're uploaded.



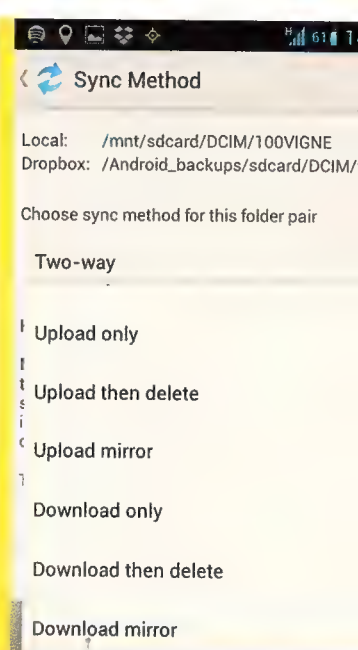
Select a folder on your handset and then choose or create a corresponding folder in Dropbox. The sync is two-way here.



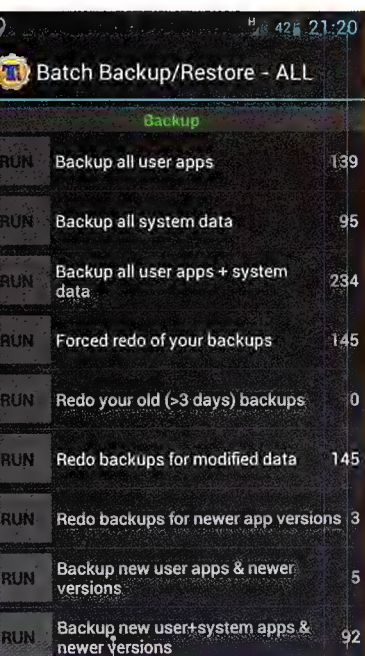
Dropsync Pro allows you to sync multiple folders to your Dropbox account.



This simple code will exclude pointless thumbnails from the backup.



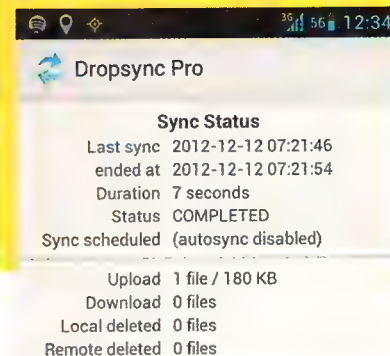
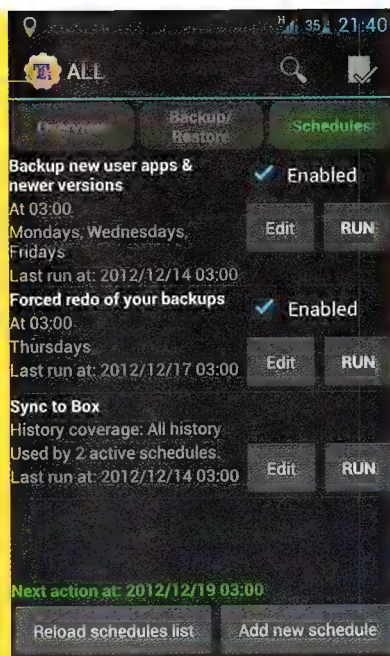
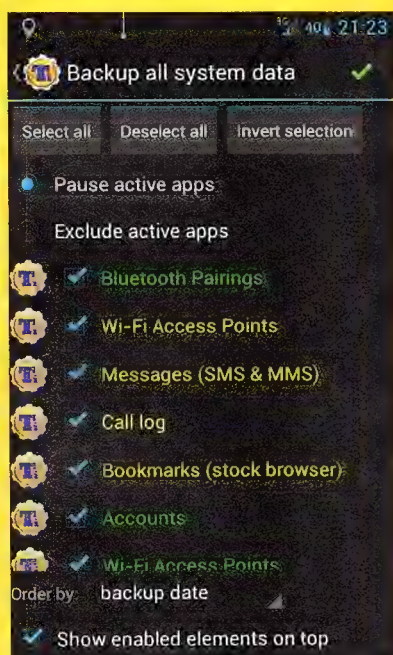
There are six different backup methods to choose from.



For simplicity, choose a batch backup option and then deselect any items you don't want to back up.

Set your backup schedule here. There are some suggestions already included with the app.

Here you'll see the system data I recommend you include in your backup.



You can easily restore apps and setting by selecting them from the list of backup items.

Now, if you have an Android tablet too, you can set your tablet to sync with your Camera folder, so that you'll have all your photos available on both devices. This way, you can use the larger screen of your tablet for photo editing and uploading.

BACK UP YOUR APPS & SETTINGS

So, having taken care of your user data, it's time to back up your system data. This includes your apps, app data (such as settings or game progress), as well as your system data (phone settings and data like SMS and call logs).

The best way to do this is using Titanium Backup, which unfortunately for some, requires a rooted device. If you don't know what this means or don't know how to enable it on your device, you can find all the information you need at forum.xda-developers.com. If your device is rooted, you should purchase the \$6.49 PRO version of Titanium Backup (the zero-click restore alone is worth the cost of entry) from Google Play.

Before diving into your first backup, it's a good idea to have a look in the 'Preferences' menu. You may want to move the backup directory to your SD card, for instance, or increase the backup history to greater than one (I have two).

The best way to begin the backups is to click on the rectangle with the tick over it up the top-right corner of the screen (batch mode) and select 'Backup all user apps + system data'. You can then deselect any apps that you don't want to back up, although user apps are generally the ones you want backed up. Hit the green arrow to begin and kick back for a little while, as this will take a few minutes.

Next up, we'll choose some system data to back up. So, back in batch mode, select 'Backup all system data' and then 'Deselect all', as you'll probably only want to back up less than 10 things in the list (you can see in the screenshot those I recommend). The XML backup feature (those with Titanium Backup logos next to them) is preferred for those backups that support it, as it allows the migration of things like call logs and text messages between incompatible ROMs.

The whole point of this article was automation, so now that you've shown Titanium Backup what system apps you're interested in, let's set schedules to redo all of your backups and back up any new apps you've installed.

To do this, touch the 'Schedules' tab. You'll see some already set up. I choose to do things differently however, with all my new and updated apps being updated three times a week ('Backup new user apps & newer versions') and a full backup of all previously backed up goodies once a week ('Forced redo of your backups'). I also have it set to upload these backups to Box when completed. Alternatively, you could have them upload to Dropbox or Google Drive – just log in to these services via the 'Preferences' menu.

To restore apps in the case of a lost device, simply download them from the cloud and copy the files to your device. Install Titanium Backup and go to the 'Restore' section of the batch menu. This way, you'll never have the misfortune of losing your games data. If you're moving to a different version of Android, not every app will be able to have its data migrated, although most will. bit.ly

Enhancing Rolly

This month, **Darren Yates** continues to look at how to build a robot from scratch using Arduino, plus how to use it to capture mobile video.

PROJECT 4

Rolly the microbot part 2

YOU'LL NEED THIS

HC-SR04

Get this ultrasonic sensor from www.ebay.com.au/ for \$2.

SG90 SERVO MOTOR

We've seen this servo selling for around \$4 on eBay.

MOTOR DRIVE SHIELD

You can get this expansion board for \$5 online.

The HC-SR04, an ultrasonic sensor for under \$2 on eBay.

If you're new to *APC*, we've been spending the last few months of this Masterclass looking at how to use the low-cost Arduino microcontroller in the real world. These little 8-bit controllers don't have the horsepower of a Core i5 chip, but they're far easier to interconnect with 'real world' devices such as motors, ultrasonic sensors and temperature/humidity monitors.

Last month, we took a big step forward in complexity by building our first autonomous robot called Rolly. Rather than a kit, we designed and built it from scratch to show how you can combine multiple components together to create a more complex device – and maybe even inspire you to have a crack at it yourself.

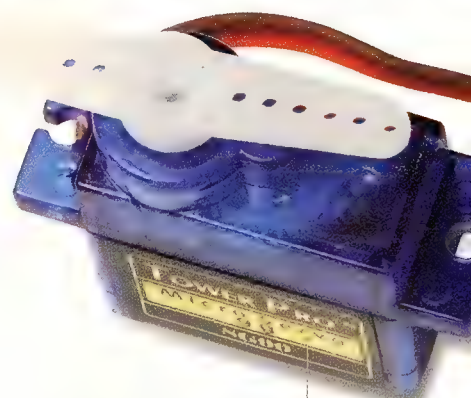
This month in this second part, we'll look at some theory behind the robot's operation, some more troubleshooting and a neat trick you can perform with your robot.

THEORY & TROUBLESHOOTING

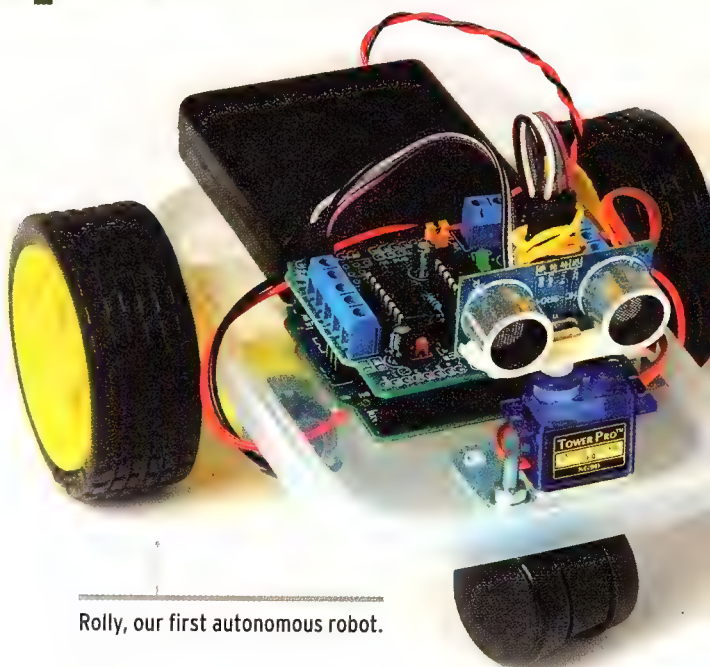
While our robot is pretty easy to put together, what's happening inside the Arduino controller itself is mostly hidden behind some brilliant code libraries made available by the Arduino community. Although you don't really need to know much about what's going on, it's always well worth understanding a little of the theory behind the main devices we're using, and how they work and interact with the software libraries.

HC-SR04 ULTRASONIC SENSOR

The tiny little HC-SR04 ultrasonic sensor looks like a pair of eyes, but what you have is an ultrasonic transmitter and receiver, the transmitter sending out pulses at around



The SG90 micro servo motor weighs just 9g and has plastic gears.



Rolly, our first autonomous robot.

40kHz and the receiver waiting for the echo to come back, similar to the way bats navigate in the dark.

With the electronics on the sensor itself taking care of the nuts and bolts of sending those pulses, the Arduino only has to initiate the pulse and measure the time it takes for the echo to return. Surprisingly, this \$2 sensor is accurate down to 3mm and works over a range of up to 4.5m. The sensor has four pins – two for power and two for control. Operation is pretty simple – the Arduino pulls the 'trigger' pin high to give the sensor the go-ahead to send a 'ranging' pulse.

The Echo pin goes high at the same time and remains high until the sensor receives the echo back from an object in front of the sensor. The length of time the Echo pin is high is proportional to the distance to any object in front, and the library code simply turns that time delay into a distance in centimetres.

SG90 SERVO MOTOR

What makes the HC-SR04 more useful is anchoring it on top of a digitally controlled servo motor. Servo motors are a three-wire geared motor that usually travel through no more than a 180° arc, but can be positioned with reasonable accuracy within that arc based on the data sent to the servo

on the data pin. These servos are normally used on RC helicopters to control rotor function, but we're using it as a 'neck' for our ultrasonic sensor.

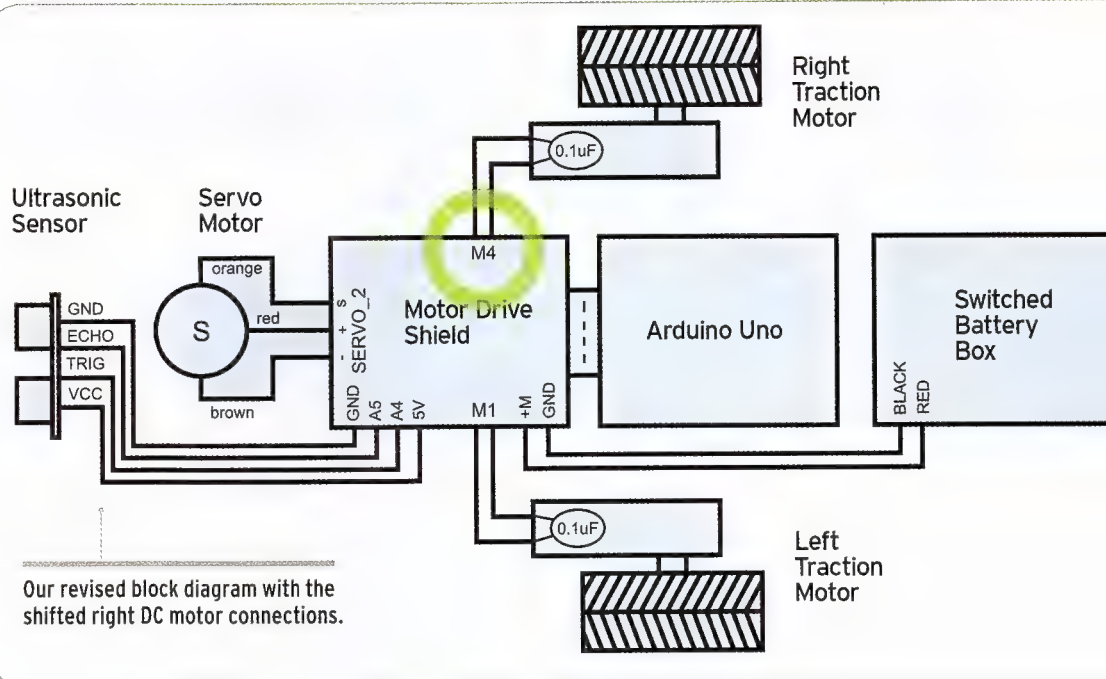
Again, the hard work of coding is handled by the built-in 'servo' library and all we need to do is tell the servo motor the degree position we want and it moves there. However, the complication arises in getting the ultrasonic sensor and the servo motor working in sync so we can create something of a distance map in front of our robot.

What our code does is move the servo motor a few degrees to its new position, waits 90ms for the servo motor to reach that position, triggers the sensor, waits another 70ms to get the echo back, moves the servo the same degree arc again to its new position, triggers another measure and so on until it reaches the end of its arc, spins the servo back to the beginning and does it all over again. This way, we not only know what's directly in front of the robot, but what's off to the left and right as well.

If you've chosen one of the low-cost SG90 model servo motors, don't force-turn it with the rotor arm attached. These are basic nylon plastic-gear servo motors – they're strong enough to handle turning our ultrasonic sensor, but won't take much to strip those gears if you start trying to force things.

MOTOR DRIVE SHIELD

While the Arduino controller can handle interfacing with LEDs, servo motors and ultrasonic sensors, what it can't do is directly control standard DC motors. These motors are basically 'dumb' motors – they have just two connectors for power. You apply power, the motor spins. Add more power, the motor spins faster. Swap the power and the motor spins in the opposite direction. That's about it. The problem is these DC motors can chew up considerably more current than the Arduino outputs



can deliver, particularly when the motor stalls (i.e., is stopped from spinning for, say, running up against a wall).

So we need a \$5 Motor Drive Shield ('shield' is Arduino-speak for expansion board) to provide some heavy lifting. Putting it simply, this expansion board has two L298D H-pack motor controller chips. H-pack refers to the way the controller operates – it uses two pairs of two MOSFETs (metal-oxide silicon field-effect transistors) with the motor as the '-' in the 'H' between the two pairs. By changing which pairs of MOSFETs conduct, you can easily swap the voltage polarity on the motor and make it change direction.

Each L298D chip can control two motors, and with two L298D chips on the board, we can handle up to four DC motors.

We also connect the servo motor and the ultrasonic sensor to this board but only as a matter of convenience – these device connections are fed through to the Arduino, which handles them directly.

The L298D chip is only really for small hobby-grade motors like we're using here. But when you're ready to get into some serious motor control, there are far more powerful motor controllers available that still work with the Arduino.

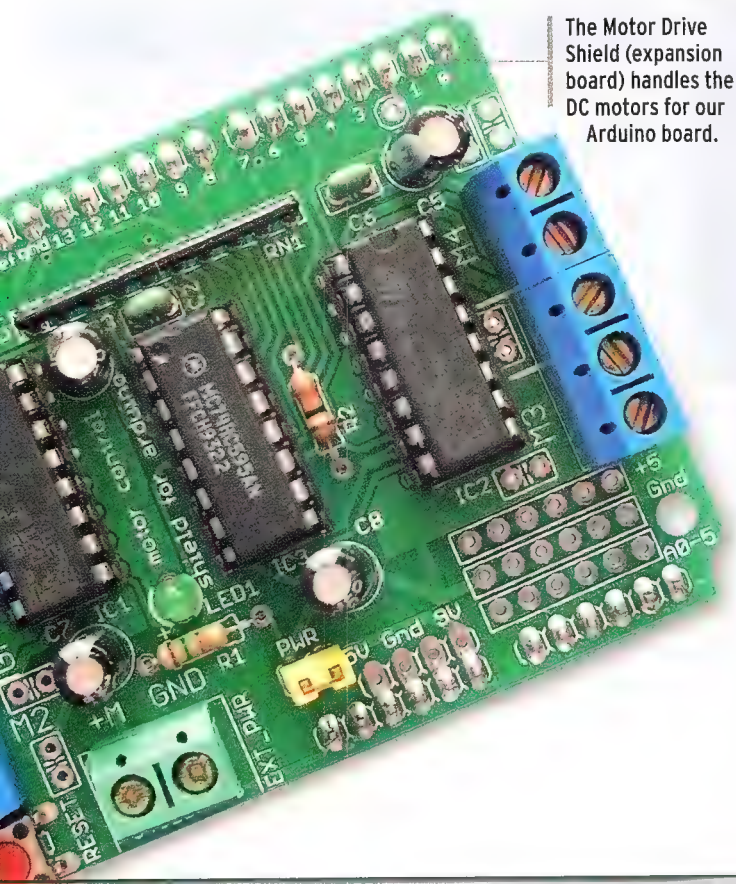
TROUBLESHOOTING

That said, we've had a small rethink about how the DC motors are wired up. In Part 1, we originally suggested both motors be controlled by just one of the two L298D chips, the one that delivers the M1 and M2 outputs. The reason we did this is because due to limitations in the Arduino, these two outputs can handle a much higher frequency in their PWM (pulse-width modulation) control – up to 64kHz, whereas outputs M3 and M4 are fixed at 1kHz. The idea is at 64kHz, the motors use a little more current but don't whine as much. In the end, we needed to keep power consumption down so we stuck with a 1kHz PWM rate.

After some more time, we'd recommend swapping the right DC motor from the M2 output to M4 and using that second L298D chip. That should spread around the heat generated and keep everything happy. You'll need to modify the `APC_4_ROBOT.ino` code by changing the line:

```
AF_DCMotor motor2(2, MOTOR12_1KHZ);
to
AF_DCMotor motor2(4, MOTOR12_1KHZ);
```

The other thing to watch out for is just to make sure you keep the ultrasonic sensor parallel to the ground. If it leans forward, you may actually drop the distance between the sensor and the floor to less than its trigger distance. That may see the robot always trying to turn away from an imaginary object when in fact it's just pointing too low. So keep it parallel to the ground (maybe even pointing upwards a bit) and it should be fine.



Add live video capture to your robot

Using free apps, a smartphone, a tablet and your Wi-Fi network, you can watch a live feed of what your robot sees.

With an autonomous robot that decides its own direction, one of the cool things you can do pretty easily is to add a video camera and capture what your robot sees. You may have seen a few RC helicopters and drones that now come with built-in or snap-on video camera modules, but for our robot you don't have to go to any elaborate lengths – just use your smartphone.

All you need is a basic mounting bracket to slot your phone into and that's pretty easy to make. We used a couple of 2 x 1 right-angle steel brackets from Bunnings – they cost 80c each and are perfect for the job. To make a simple U-channel slot, we double-side-taped one to the top of the battery case and added a second bracket on top of the first, facing the other way.

To make sure your phone stays somewhat in place, just add another row of double-sided tape to the base on the slot so your phone will stay in position. Switch your phone on, set it to 'video' mode and just manoeuvre it until you get a good shot of what's in front (I like to get the sweeping action of the ultrasonic sensor in at the edge of the frame so you can see the phone is riding on the back of the robot).

Set your phone to 'record', switch on the robot and away you go.

You can download the video to your computer and watch it on your screen or send it to your TV.

LIVE MONITORING

If you have a couple of Android phones or an Android phone and tablet plus a Wi-Fi network, you can turn Rolly into a live-video-streaming robot and watch where he goes in real-time. What's more, you can do it all with free software.

First, head to Google Play and download the free IP Webcam app to your smartphone. IP Webcam turns your smartphone into a video webcam and server that streams the video output over your wireless network.

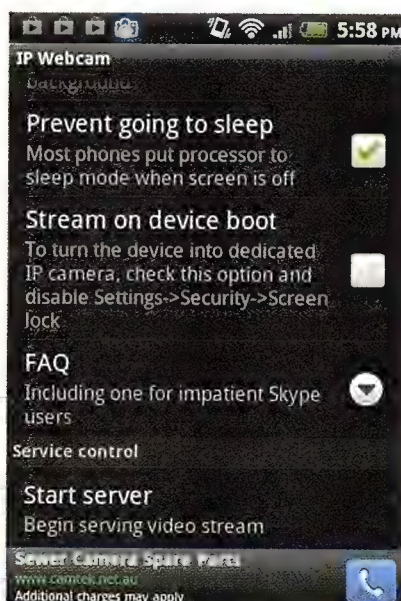
On your second Android device, download tinyCam Monitor FREE, also from Google Play, set it to view the output from your smartphone's IP address and you'll be able to view the output from your smartphone's camera in real-time on the second device.

If you don't have a second phone or tablet, you can still use your PC or notebook – just point your web browser to the IP address of your phone (including the '8080' port address) and the IP Webcam web

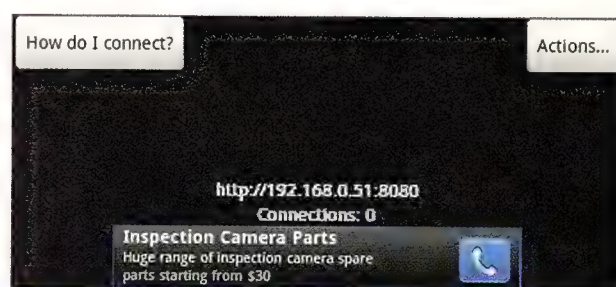
STEP-BY-STEP: ADDING LIVE VIDEO CAPTURE T



01 Install IP Webcam onto your smartphone, launch it and it'll automatically open up to 'Settings'. Check that the 'Resolution' is on your phone's maximum supported video resolution for best quality.



02 Assuming you already have your phone connected to your home Wi-Fi network, scroll down and select 'Start Server'.



03 IP Webcam should now switch to 'video capture' mode and will display its IP address towards the bottom of the screen. Note this address – you'll need it in a moment.



04 If you have your PC running, you can check that the IP Webcam web server is running by loading up your web browser and pointing it to that IP address from step 2 (you must include '8080' in the address or it won't work). Forget the sound – well, at least at the same time as the vision. It's about five seconds out of sync. But if you see an image from your phone, it's working.

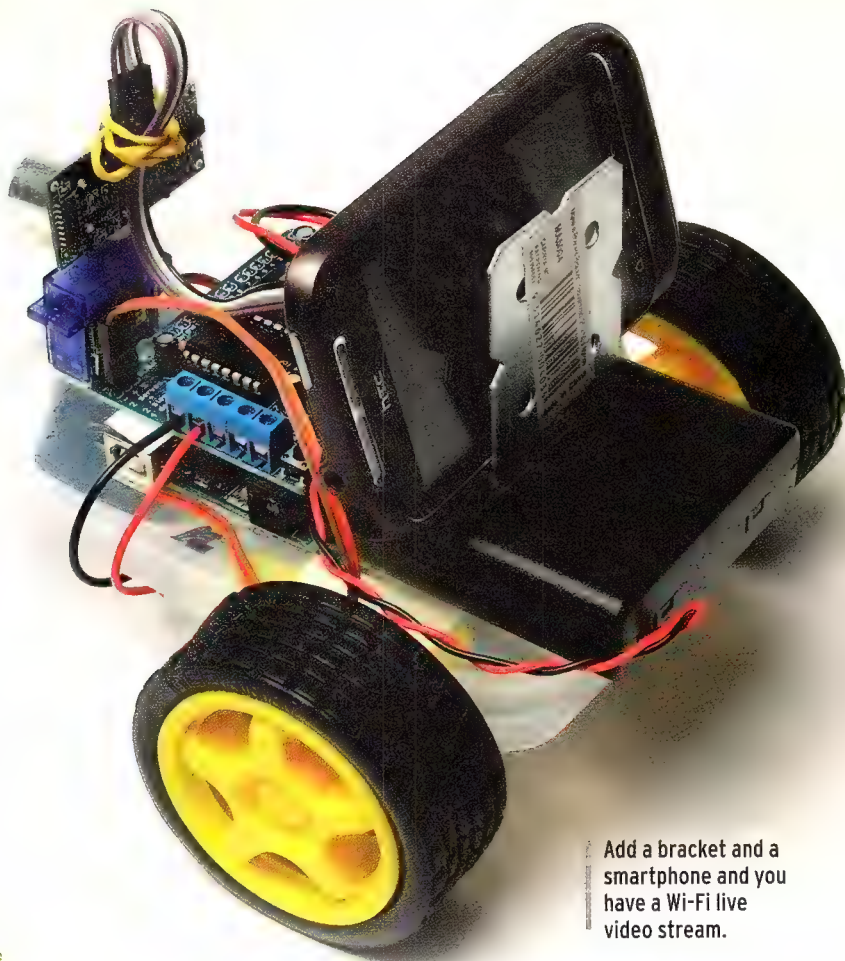
server will still allow you to see the action. At this stage, we haven't found an equivalent free iOS app for IP Webcam, but you just need an app that does the same thing – turns the phone into an IP webcam and has its own web server built in.

It's important you don't do what I did and pick up your robot with the phone still attached to it. I was stupid enough to not have the double-sided tape on it, the phone fell out, hit the ground from about a metre and the screen shattered. So this is definitely 'do what I say, don't do what I did' territory.

Follow our step-by-step guide and you should have it up and running in around half an hour. The thing to remember is the more 'basic' your robot smartphone, the lower the video quality and slower the frame rate. But if you have an old smartphone lying around in a drawer, this is a great way to give it something to do.

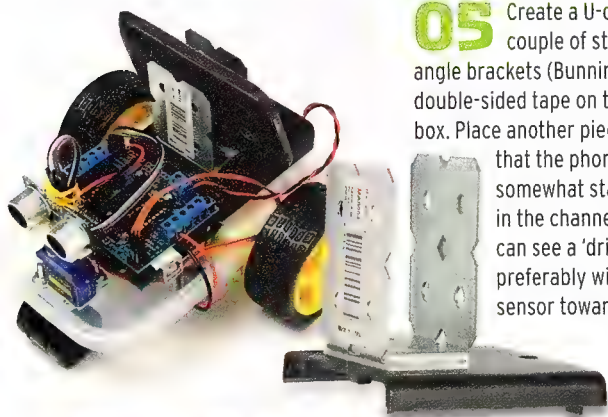
NEXT MONTH

We're returning to more classical endeavours next month, looking more at pulse width modulation (PWM) and even though it was never designed to do it, seeing if we can get our Arduino Uno making a few sounds. [CLICK](#)



Add a bracket and a smartphone and you have a Wi-Fi live video stream.

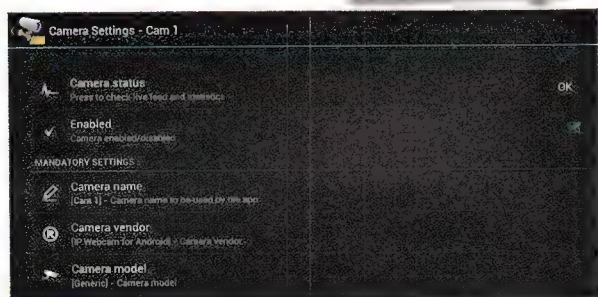
YOUR ROBOT



05 Create a U-channel slot from a couple of stainless-steel right-angle brackets (Bunnings, 80c each) using double-sided tape on top of the battery box. Place another piece inside the channel that the phone can rest on and be somewhat stable. Place your phone in the channel and align it so you can see a 'driver' view of your robot, preferably with the ultrasonic sensor towards the side of the view.



06 Grab a second Android smartphone or tablet and install tinyCam Monitor FREE from Google Play. When it comes up, cancel the pop-up questions and select 'Manage Cameras' from the main screen.



07 When asked if you'd like to add a new camera, click 'Yes'. On the 'Camera Settings - Cam 1' screen, change the 'Camera Vendor' to 'IP Webcam for Android' and change the IP address to the one from step 2 (don't worry about the ':8080' here).



08 Press the 'OK' button at the top-right and use the back button to go back to the main screen, but this time select 'Live view', choose your camera, select 'Switch Layout' when you get the four-box view and your IP Webcam-powered smartphone should come into full-screen view. Set Rolly off and you can now watch where he goes in real time.



PART 7

Responsive web design

In this month's instalment of our HTML5 masterclass, **John Allsopp** explains how to adapt your web designs for use on different devices.

APC EXPERT

JOHN ALLSOPP

With a background in computer science and mathematics – and a great deal of good fortune – John Allsopp's life collided with the web in the early '90s. For nearly 20 years he has developed software for web developers, built web sites and apps, and written books, countless articles and tutorials for print and online publications. In 2000, he wrote *A Dao of Web Design*, which over a decade later continues to be widely cited as the theoretical foundation for Responsive Web Design.

True or false: A web page should appear identical (or as nearly as possible) in every browser?

A decade ago, even more recently, almost every web designer or developer might have responded with "well of course, that's my job!". Then the iPhone happened and suddenly, it became obvious that one size didn't fit all. (In fairness, many web developers had long felt one of the strengths of the web was that a single codebase could adapt to all sorts of variables, like the width of a user's window, or the font size the user prefers, to name just a couple.)

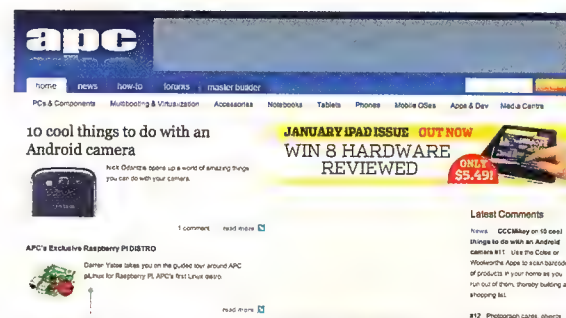
These days, web developers don't try to make their sites look identical in every browser, on every device; they try to design in such a way that pages *adapt* to the user's context.

In the last couple of years, the term 'responsive web design' (often shortened to RWD) has rather swept the web design world. First introduced by Ethan Marcotte (tinyurl.com/3aj4zhy) and most commonly associated originally with the redesign of the *Boston Globe* web site, the idea of RWD is far from new, but has gained immediacy and relevance now that the web is increasingly viewed on mobile devices, tablets and game consoles (handheld and TV-based), and with an explosion in TV-based web use just around the corner.

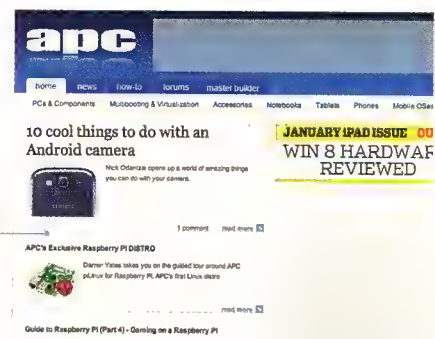
Here, we're going to focus on some of the challenges, techniques and technologies for adapting the same HTML to different screen sizes and resolutions, using CSS3 once again. Before we do that, let's take a look at one of the most important tools in the arsenal of designers when it comes to creating responsive designs, fluid layouts.

FLUID LAYOUTS

The idea of a fluid layout is far from new. In essence, it's about designing so the width of page content adapts to the width of the user's screen or browser window. The main alternative approach to page content design is what's called 'fixed-width'



The APC web site when the user's window is 960px wide.



The APC web site when the user's window is 720px wide, with content clipped on the right.

designs, where page elements are always the same number of pixels wide. While neither is more complex than the other, the latter is far more common, though far less responsive.

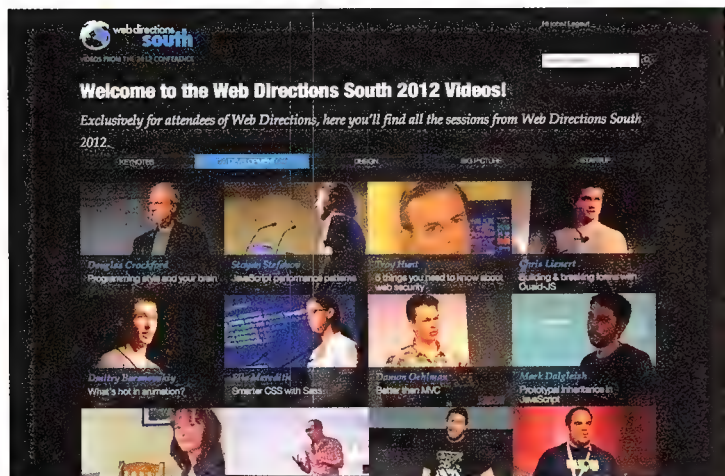
Let's take a look at these in action. I'm going to be picking on APC's web site (mostly because it's easier to get clearance to do so). If you visit apcmag.com with a desktop browser and resize your window, you'll notice that the three columns of content stay exactly the same width, regardless of the window size. The APC screenshots are the page at 1,280px wide, 960px wide (the fixed width of the content) and then 720px wide. Once the user's window is less than 960px wide, the content is clipped on the right-hand side.

In the age of ubiquitous desktop computing, this wasn't a terrible approach, as we can almost guarantee the average user will be able to open their window wider than 960px. But that day is past.

So, as a first step toward being more responsive to our user's context, we can specify the width of our page content not as a fixed number of pixels, but as a percentage. That way, as the window widens and narrows, or depending on the width of the user's device, the columns can also widen and narrow. Here's a site I've been building recently as a companion to the videos from a conference I run, which uses this approach.

The APC web site when the user's window is 1,280px wide.





Above, the videos site when the user's window is 1,280px wide. The block of images is 80% of the width of the window, with 10% margin left and right, while each image itself is 25% of the block.



Above, the videos site when the user's window is 960px wide. See how the width of the block of images is still 80% of the width of the window? We still have four images per row, though each is now narrower (still 25%, but fewer pixels).



At left we see the videos site when the user's window is 570px wide. With this design, I've decided that there should be a minimum pixel width at which the block of images will no longer narrow.

We run into the same problem as the APC site, where the block of images is wider than the window. This is a design decision (I didn't want these blocks to be too small) and it's implemented using the min-width CSS property. Here's the simplified HTML and CSS:

```
<section id="images">
<div class="session">
    
    <div class="description">about the session</div>
</div>
<div class="session">
    
    <div class="description">about the session</div>
</div>
```

The CSS is as follows:

```
</section>

.images {
    width: 80%;
    margin: 0 10%;
    min-width: 600px;
}
.session {
    width: 25%;
}
```

So, with the tools available to us a decade or more ago, and only two selectors and four properties in total, we've been able to make our site adapt to more devices. We've made them more 'responsive' to our user. But we can do more, using new and improved features of CSS3.

ENTER THE IPHONE

Until the introduction of the iPhone, talk about the need for web designs to adapt to different screen sizes and resolutions was largely theoretical. Yes, there were mobile devices with web browsers, but their use for all kinds of reasons was quite niche. The iPhone put a sophisticated modern web browser in the pocket of millions and then quickly tens of millions.

With Mobile Safari, the iPhone's browser, Apple had a challenge: How to display on a 320px-wide screen content almost always designed to be best viewed at 720px wide or wider? Think about the APC web site. If Apple treated the iPhone's screen as the width to display the site, it would display it like this (right).

This would have made almost the entire web effectively unusable. So, what do we see? Apple's approach was to scale the page as if it were 980px wide (so, by roughly 3:1). That is, it's zoomed in three times.

How Mobile Safari would display the APC home page if it treated its screen by default as 320px wide.



howto ● html5 masterclass

Luckily, and probably by design, the fixed width of the APC page is 960px as we saw, so it displays nicely on the iPhone. Other mobile devices and browsers have followed in the footsteps of this approach.

However, as the number of mobile web users has exploded, it's become increasingly important to provide mobile-friendly versions of your web site. So, let's look at how modern CSS and HTML allows us to do this.

TELLING THE BROWSER THE VIEWPORT SIZE

Our first step is to tell the browser what width we want it to treat our page as being. If we don't want it to pretend that's 980px wide, here's what we add to the head of our HTML document:

```
<meta name="viewport" content="width=device-width">
```

This tells the browser in a mobile or tablet device to treat the width of the page as the same as the width of the device. Unless we do this, mobile and tablet devices will most likely continue to zoom the content of your pages. OK, now we're ready to start designing our responsive site.

MEDIA QUERIES

Way back in CSS2, media queries were introduced as a way of specifying different style sheets for when a site was being displayed in different types of media. In theory, we could have different styles depending on whether the user was viewing a page on a PC screen, on a TV, a handheld device, when printed onto a page or projected on a screen, among others. For a variety of reasons, these original media queries didn't really take off, with the exception of print style sheets, which were for a time quite common.

CSS3 introduced a far more powerful way of targeting CSS to different devices, by extending media queries to include various device characteristics, such as window size or screen resolution. We can tailor our CSS based on such features as the width or height of the browser window; the width or height of the device screen; the device's orientation (landscape or portrait); the device's screen resolution; and more.

When the iPhone introduced genuinely usable mobile web browsing, it didn't identify itself as a handheld device, so media queries targeting these media types wouldn't style pages for the iPhone different from a desktop browser. But the iPhone *did* support the more sophisticated CSS3 media queries, enabling developers to tailor sites for users of these phones and later Android phones, iPads and other tablets.

So, what do media queries and responsive web design have to do with one another? Well, as we saw, responsive web design is about tailoring a page design to the characteristics of a device, such as its screen width or resolution. And delivering different style sheets based on these device capabilities is what media queries are all about.

When designing for different screen sizes and resolutions, what will be the most significant impact on a design as these change? As we've seen, adapting the width of page elements to the width of the screen or browser window is one. Another is text size. And as we'll see shortly, as new higher-resolution screens become increasingly common, particularly on mobile and tablet devices, but also on laptop and desktop screens, image size and resolution is increasingly an issue. Let's take a look at how we could address each of these using media queries.

PAGE WIDTHS

As screen widths decrease, multi-column layouts become more unwieldy. A simple approach as windows or screens become narrower is to drop the number of columns in our design. First, let's set up the basic three-column HTML and CSS:

```
<section id="main-content">Main</section>
<section id="features">Features</section>
<aside id="social-media">SM</aside>
```

```
@media (min-width: 720px) {
```

```
  #main-content {
    width: 55%;
    float: left;
```



How Mobile Safari actually displays the APC home page.

```
}

#features {
  width: 25%;
  float: left;
}

#social-media {
  width: 15%;
  float: left;
}
}
```

What we'll want to do is have this layout for when the window is greater than, say, 1,024px, and switch to a new layout, with only the main content and features columns displaying when the window is narrower than this. How can we do this? Enter CSS3 media queries.

CSS3 MEDIA QUERIES

With CSS3 media queries, we can specify CSS to be applied not just for a specific medium, but also for specific device characteristics. The basic construction of a media query is like this:

```
@media (min-width: 720px) {

  #main-content {
    width: 55%;
    float: left;
  }

  #features {
    width: 25%;
    float: left;
  }

  #social-media {
    width: 15%;
    float: left;
  }
}
```

What we've done is contained our CSS inside a *@media* rule, which itself will go into our style sheet. This rule has an important condition: in this case, that the minimum width for this rule to apply is 720px. If the window is made narrower than this, the rule doesn't apply. Next, we'll create another *@media* rule for when the window or device width is between 480px and 720px. At these widths, we'll show only the left two columns.

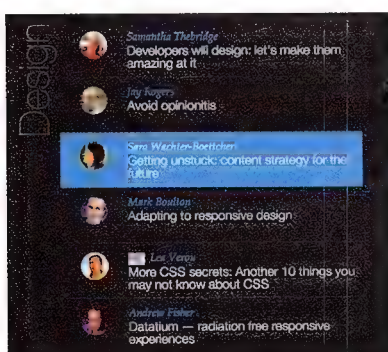

```
@media (min-width: 481px) and (max-width: 719px) {
```

```
  #main-content {
    width: 65%;
    float: left;
  }

  #features {
    width: 30%;
    float: left;
  }

  #social-media {
    display: none;
  }
}
```

As an exercise, try setting up a final `@media` rule to only show the main content column on devices or in windows 480px or narrower. You might also like to consider what happens to the size of your text as the width of the screen or devices gets smaller. Here's a recent example of a responsive design of my own. When on most screens, content is collapsed to be displayed when the user clicks or taps the screen. On mobile devices (widths less than 480px), this content expands and is displayed in a single column, not the two columns of the full-width site.



Above: The site when viewed at widths greater than 480px. Right: The site when viewed on a screen less than 480px wide.



THE CHALLENGE OF HIGH RESOLUTION

One particularly modern web design challenge is presented by higher-resolution screens found in modern mobile devices and tablets, and now 'Retina' MacBook Pros and other laptop devices. Images that look acceptable on the average desktop or laptop screen will often look

substandard on these devices. There are a number of ways to address this issue.

The first is to use fewer images. Many developers still use images where CSS3 features like shadows, gradients and opacity are ideal, as we saw last month. Many designers and developers continue to use images of text to get the precise font they want (we'll see how CSS3 gives us the ability to embed almost any font in any web site in an upcoming edition). When you absolutely must use images, then there's a dilemma. Higher-resolution images are likely to look fine on lower-resolution screens, so we can just use higher-resolution images, right? Except, of course, such images are larger in terms of file size, so particularly over mobile networks, they're likely to negatively impact the page load times. "Ah ha!" I hear you cry, "if these are in my CSS, then I'll just use a media query to specify a higher-resolution image for higher-resolution screens". And indeed, we can write media queries to target devices based on their screen resolution, like this:

```
@media (min-device-pixel-ratio: 2){}
```

This media rule will in effect apply to devices that have high-resolution screens (there's a link in the 'Further reading' box below for those who want to know the ins and outs). For now, we'll need to provide prefixed versions for different browsers. The long and the short of it is, if you want an `@media` rule that specifically targets high-resolution screens, currently you need a media query like this:

```
@media (-webkit-min-device-pixel-ratio: 2), /* Webkit-based browsers */
      (min-moz-device-pixel-ratio: 2), /* Older Firefox browsers (prior to Firefox 16) */
      (min-resolution: 192dpi), /* Everyone else */
      (min-resolution: 1.5dppx) /* The Future */
{*CSS for these devices goes here*}
```

So now we can use high-resolution images in our CSS when we have high-resolution devices. However, there are still two important issues: this doesn't apply to HTML `img` elements and browsers will download images specified in style sheets, even when the media criteria aren't met! That means if we specify both ordinary and high-resolution images, the browsers will now download *both*. Which is worse than simply specifying high-resolution images, as it's twice as many HTTP requests and more bandwidth use.

To tell the truth, right at this moment there isn't one specific solution to this challenge. However, there's a fantastic writeup from Chris Coyier at tinyurl.com/7vjvchh, whose 'CSS Tricks' web site we've mentioned several times already in this series. For more on the right solution to this challenge for your particular situation, it's a must-read.

TWO STEPS FORWARD, ONE STEP BACK?

The promise of a wide variety of devices for accessing the web has truly arrived, particularly in the last couple of years. But we need to be careful of what we wish for. Designing and developing sites that work acceptably across this range of devices is extra work. Designing sites that work well across this range requires knowledge, experimentation and lots of hard work. However, the rewards are there for those who do it well. [@TDC](#)

FURTHER READING

- The article that started it all, it rather flatteringly starts with a long quote from an essay I wrote about web design in 2000: tinyurl.com/3aj4zhy
- The article I wrote back in 2000, which is seen by some as the originator for many of the ideas of RWD (I used the term 'adaptive web design', which I still prefer): www.alistapart.com/articles/dao
- Chris Coyier's detailed overview of techniques for dealing with high-resolution devices and images: tinyurl.com/7vjvchh
- Apple's documentation on using the `viewport` meta element: tinyurl.com/arqkf89

- The W3C on media queries with high-resolution devices: tinyurl.com/b62sfky
- A great ebook (not free, but highly recommended) on designing and developing for high-resolution screens, by the legendary Thomas Fuchs: retinify.me
- Thomas also has some thoughts on media queries for high-resolution devices: tinyurl.com/bth5m27
- Some thoughts on developing for TV-based browsers: tinyurl.com/arets34

If you want to
reach **new**
customers,
you will love what
magazines
can do for your
business

Find out at our **FREE** marketing expo

BAUER PRINTWORKS - AUSTRALIA'S BIGGEST MAGAZINE EXPO IS NOW IN ITS FIFTH YEAR. VISITING OUR EXPO IS THE EASIEST WAY FOR YOU TO LEARN HOW TO GROW YOUR BUSINESS USING THE POWER OF MAGAZINES



NO MATTER WHAT YOUR BUSINESS WE HAVE YOU COVERED

» IN JUST 45 MINUTES

find out how to reach new customers, stay ahead of the competition and drive sales using Australia's leading magazine titles and websites.

» AMAZING MARKETING CONCEPT

that makes magazine and digital marketing simple, effective and so affordable that any business can advertise.

» SAVE THOUSANDS

with our special expo packages - targeted schedules, rate protection, and FREE creative.

» A MUST-ATTEND EVENT

for business owners and managers, advertising and marketing executives, ad agencies, PR and promotion companies.

» MELBOURNE

Monday 25th February to Tuesday 26th February
Melbourne Town Hall,
90/120 Swanston St,
Melbourne

» BRISBANE

Monday 4th March
Mirra, 86 Bridge St,
Fortitude Valley

» SYDNEY

Monday 11th March to
Wednesday 13th March
Carriageworks,
245 Wilson St, Eveleigh

» CHOOSE FROM 6 CONVENIENT SESSIONS DAILY:

9.30am, 11am, 12.30pm,
2pm, 3.30pm and 5pm

REGISTER NOW - DON'T MISS OUT! SPACES ARE STRICTLY LIMITED

REGISTER ONLINE AT
WWW.BAUERPRINTWORKS.COM.AU
OR BY PHONING 1300 975 591



WIN!

Come along to Bauer Printworks and find out how you could be in the running to WIN a **Lexus CT 200h**

printworks
the magazine & digital expo



MEDIA GROUP



Conditions apply see www.bauerprintworks.com.au. Competition closes at 05:00 PM (AEDST) on Friday, February 8, 2014. Open to NSW, VIC and QLD residents 18+ who purchase an advertising package on behalf of their business. Prize awarded to contract signee, unless otherwise advised. One package per advertiser only. Value of package determines the number of entries into the draw; see terms for full details. Packages must be paid up to date (with no arrears) as at 8/2/14. Draw at 2pm AEDST on 11/2/14. Winner's name will be published in The Australian on 14/3/14. The Promoter is Bauer Media Limited (ABN 18 053 273 546). Authorised under permit numbers: NSW Permit No. LTPS/12/10433, VIC Permit No. 12/3189.

SURVIVE!

In the zombie apocalypse, your worst enemies might actually be humans, says **Evan Lahti**.

The rules used to be simple – don't get bitten, destroy the brain. Zombie games like *Left 4 Dead*, *Killing Floor* and *Resident Evil* shared a vaguely similar approach, even as they offered terrific takes on one of horror's most ubiquitous subgenres.

But zombie games are maturing. They're mutating beyond simply being zombie-themed shooters and redefining what we know as the zombie FPS into more of a genuine survival game. You still have to get headshots and avoid getting gnawed, but there are new threats to manage. Thirst. Hunger. Darkness. Scarce resources. Untrustworthy strangers.

A gun can't solve every problem you have in *DayZ*, *The War Z* and

No More Room in Hell, in other words. These upcoming zombie games demand different skills – communication, leadership, a knack for navigation over open terrain and nerves of steel. Even a little deception will help you survive. In short, they're the zombie games we've dreamed of: demanding and realistic survival simulations that ask a lot of you, but reward players with unforgettable, self-authored stories of sacrifice, horror and survival.

While all three titles are still works in progress, they're playable in their nascent state. But before you enter these respective worlds of zombie hordes, read this story so you're fully prepared for the horror that's in store.

DayZ

Everything you learnt about surviving the zombie apocalypse was wrong...

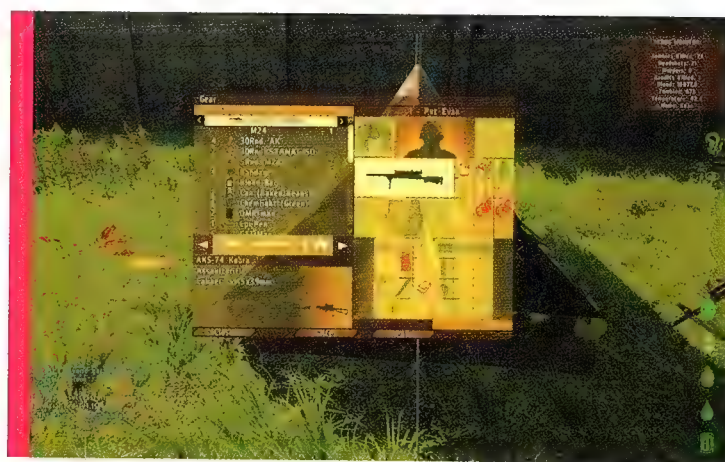
Last April, an unfinished mod developed by a former New Zealand military officer was quietly released. The add-on was designed for *Arma II*, a niche military simulation game from Czech studio Bohemia Interactive, best known as the creator of *Operation Flashpoint*.

Initially, *DayZ* arrived with little fanfare. "I developed it, essentially, in secret and that removes a lot of ego; it removes a lot of promises," creator Dean Hall told us in May. But *DayZ* would catch PC gaming by complete surprise. In just four months, it had drawn 1 million unique players. Hundreds of 50-player custom servers hosting the still-incomplete, alpha version of the mod sprung up in a matter of weeks. Almost 200,000 people were playing every day at the peak of the mod's popularity in August. The zombie game that gamers had openly fantasised about on message boards – an open-world, do-anything, go-anywhere survival game – had appeared out of thin air, albeit in a rough and half-realised form.

We now consider *DayZ* the progenitor of the modern swarm of realistic zombie games. Its average daily population has since dwindled to a still-substantial 50,000 in October, but this lull is actually just downtime preceding a larger release. Its spark of success has spun off a full-time, in-house development team at Bohemia led by the mod's creator, Dean 'Rocket' Hall. This team labours away on a stand-alone version of *DayZ* – a more complete, fuller-featured version of the mod.

Even with placeholder animations, annoying bugs and incomplete features, *DayZ* has a death-grip on gamers' attention. Relative to the zombie games that preceded it, it offers unprecedented freedom and makes other facets of the apocalypse – including fellow survivors – as much of a threat as the undead. Its style of zombie realism arose partly from the inspiration of its creator. Hall had originally pitched the mod as a zombie-less training simulator, having endured survival training himself during an exchange program with the Singaporean military.

A lot of *DayZ*'s appeal is owed to *Arma II*, whose Real Virtuality engine



Loot is everything in *DayZ*. Your carrying capacity depends on the size of your backpack – a rare ruck can become a literal target on your back. *DayZ*'s rigid and unintuitive inventory interface, unfortunately, is a well-documented shortcoming.

forms a foundation for its authenticity. *Arma II*'s creators went to great lengths to create high-fidelity game technology and *DayZ* benefits from sharing systems that model vehicle fuel consumption and modular vehicle damage, a real-time night/day cycle, a working compass and detailed topographical map, voice chat that's affected by proximity and an engine that can render objects over long distances.

A particular asset is *Arma II*'s ballistics modelling, which distinguishes it from the vast majority of shooters in gaming. Bullets travel parabolically in *Arma II* and *DayZ* based on their calibre, so the behaviour of a hunting rifle, revolver and M4A1 carbine, for example, differ significantly.

Getting a knack for your weapon is as important as just finding one – someone who knows the nuances of a low-end gun like a Lee Enfield (a bolt-action WWI rifle) is arguably more dangerous than someone holding an AS50 anti-material sniper rifle but doesn't know how to zero

The War Z

A sincere form of flattery made easier to install.

Faster than you could hoard canned goods, in July 2012, a *DayZ* imitator emerged. Within a month of *DayZ*'s flash of popularity, a new studio told the gaming world it was hard at work on its own player-versus-player and player-versus-zombie, open-world survival sandbox. And unbelievably, Hammerpoint Interactive released its new project on time, as promised, before the end of 2012.

The announcement of *The War Z* was met with skepticism and cynicism flecked with curiosity. Its features were uncomfortably familiar: a huge, verdant open world dotted with mundane and military loot, a first-person and third-person camera and dedicated servers, all laid out to support unscripted, persistent gameplay between zombies and other players. Even the look of its characters – baseball cap-wearing, backpacked survivors – resembled *DayZ*'s. *The War Z* wasn't being subtle about its inspiration.

But if this blatant borrowing of ideas resulted in a good game, would it matter? More details snuck out as the press got early access. *The War Z* would include a player-written questing system, appearance customisation, the ability to place bounties on other players' heads, an RPG-style skill system and a microtransaction store for items.

Perhaps most interesting was *The War Z*'s promise to offer something called Strongholds – small, private instances like a cabin in the woods, a farm, a small town on a cliffside or a train yard that clans or individual players can rent for money. Even if these features don't appeal to you personally, they painted a picture of a game that was less of a clone than was originally thought.

"In fact, we're fans of the mod," *The War Z* executive producer Sergey Titov said to VG247.com when asked about *DayZ* in October. "Ultimately, we hope gamers end up playing both *The War Z* and the *DayZ* stand-alone. It's difficult to compare at the moment, but although there are similarities, we tried creating a game that was a little bit easier to access and play, and that would allow players to be creative and create their own scenarios."

There's some consensus that this isn't a 'there's only room for one of us in this town' situation, but rather a sign that this subgenre is simply in the process of losing that prefix. Competition between companies usually benefits consumers and *The War Z* has a lot to live up to.

Built atop a military simulator, *DayZ* carries a lot of inherent traits



Using separate real-money and in-game currencies, *The War Z* allows players to purchase some basic items (like melee weapons and food) before they spawn into the game. If you die, anything you're carrying is dropped.

that lend itself to survival simulation and not all of them are easily reproducible. But the other side of that coin is that *The War Z* isn't burdened by some of *DayZ*'s inherent quirks, and seems to benefit from being coded from scratch. It's offering a few simple antidotes to some of *DayZ*'s issues, like confusing inventory management, complicated weapon handling and rigid animations.

It's also favouring accessibility more than *DayZ*. *The War Z* does have permadeath – if you die, you lose that character and their items forever – but only if you're playing with a Hardcore mode character. Normal mode simply temporarily locks your ability to play that character for 24 hours and removes any items they were carrying. Likewise, you can get a leg up on a new character by spending in-game currency that persists across all characters, so it's easier to recover from a death.

The focus on accessibility extends to gameplay itself, where weapon behaviour is more akin to games like *Battlefield 3*. An assault rifle or a pistol handles with the lightness and responsiveness you'd expect in an ordinary multiplayer FPS. You'll still have to keep noise in mind when firing – letting loose with a sniper rifle will make you awfully popular in your part of the map. There are also small but significant

FIVE INCREDIBLE LEFT 4 DEAD 2 CUSTOM CAMPAIGNS

L4D2 may lack realism, but it's still the best zombie-themed action game available. The modding community has created hundreds of fantastic custom campaigns that are a cinch to install.



Questionable Ethics

Fight your way through a white-walled, underground, secret research facility filled with traps (like a ceiling that drops cars on you) and endless tricks. Almost *Portal*-like in its devious cleverness, *Questionable Ethics* is the work of a Korean modder. Play the sequel after you're done.

tinyurl.com/3i5hbbz



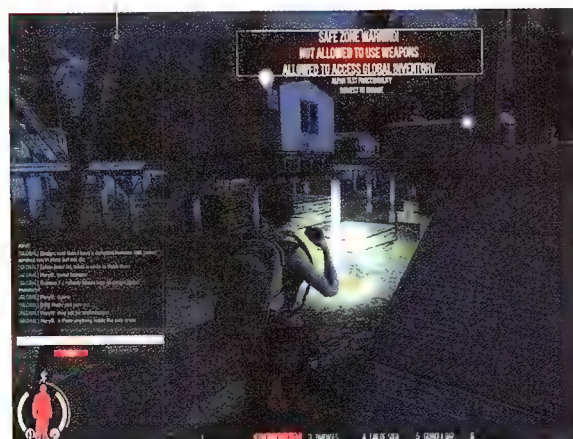
Helms Deep Reborn

The *Lord of the Rings: The Two Towers*' iconic castle siege is reproduced here with almost 1:1 authenticity, with the exception of *L4D*'s menagerie of uglies swapped in for Uruk-hai. This multistage survival map has you meat-grinding through hundreds of zombies, climaxing in a defence of – and then escape from – the throne room. Nonstop violence and calamity. tinyurl.com/395bqrq



A stamina mechanic is one of the small-but-significant differences separating *The War Z* from *DayZ*. You can't run forever, but the undead can – sprinting into a town while out of breath might be all it takes to doom you.

Night-time in *The War Z* is inherently dangerous. Flares, chemlights and flashlights will help you find your way around, but any light sources will inevitably draw attention from other players.



differences between *DayZ* and *The War Z* in player movement. You can crouch and go prone in both games, but *The War Z* has a jump button. More realistically, you can't sprint infinitely in *The War Z* – running depletes a stamina metre that recharges over time, so you'll want to conserve your sprinting until you really need it.

The War Z also features a few imaginative zombie types. 'Sleepers' zombies deceptively lie dormant on the ground, but rise if they notice you nearby. There's also a rare 'stem cell-carrying' zombie that only appears at night. "Visually, they're very different from the others; they're much more aggressive, fast and agile. They're rare – they hunt only at night so the best place to find them will be larger cities at night-time," exec producer Sergey Titov explains.

Killing one of these super-zombies will yield stem cells, which are a kind of special currency within *The War Z* that can also be used to create a vaccine. Hammerpoint hopes the relative difficulty of bagging one of these zombies will inspire some creative teamwork and competition among players. These corpses lurk in a world about 160km² in size – about 70% the size of Chernarus in *DayZ*. Encouragingly, Hammerpoint has said anyone who buys *The War Z* will receive any additional maps that

are released. The game's stock map is inspired by Colorado, a rocky wilderness pocked with outposts, lakes and small towns.

Before *The War Z*'s foundation release, the worry was that the need to get the game out there as quickly as possible had left anti-cheat features, netcode or other fundamental systems incomplete. However, we're encouraged by the fact that, despite *The War Z*'s focus on accessibility, the game still reproduces some of the feelings of self-preservation, carefulness and spontaneous danger that arise in *DayZ*.

It's a game, in other words, where death can come unexpectedly and at any moment. Idling in front of a windowsill for too long while scouring an office building for supplies can be all it takes to doom you, but (if you're playing on Normal mode), when the Grim Reaper strikes, it isn't quite as painful or permanent. Most exciting is *The War Z*'s system for formalising player interactions with a player-authored quest system, where you can hire other players to create a system to complete tasks.



Golden Eye 4 Dead

An amalgamation of settings drawn from the 1995 Bond film, including a dam, runway and a hidden space base in Aztec ruins, *G4D* is more than a pile of references; it's a genuinely taxing and creatively designed campaign, and one that takes clever liberties with its source material. Be on the lookout for Easter eggs. tinyurl.com/6iopmww



Lets Build a Rocket

Instead of a sprawling campaign that has you racing to the safe room as a finish line, *Let's Build a Rocket* gathers the survivors around a small launch pad and hangar. Using a computer panel, you research new technology to unlock *L4D2*'s weapons as zombies harass, juggling these tasks as you and teammates slowly construct a rocket to escape Earth. tinyurl.com/cctm4jy



Suicide Blitz 2

A great example of the indulgent set pieces, *Suicide Blitz 2* pushes the survivors through a bowling alley, a maximum security prison and finally to the 50-yard line of a football stadium for a titular stand-off against hulking zombie Tanks in football jerseys. tinyurl.com/67dty8e

No More Room in Hell

Expect at least half of your team to die.

Unlike *The War Z* and *DayZ*, *No More Room in Hell* doesn't fit into the newly born 'outdoor survival game' category. It's fairer to call it an advanced, hardcore take on conventional cooperative zombie games like *Left 4 Dead*. In development for a decade before releasing last year, the Source engine mod was recently selected through Steam Greenlight to release as a full, free game on Steam, but you can play it now by downloading it from www.nomoreroominhell.com.

What *NMRIH* shares with *DayZ* (other than an awkward name) is the unapologetic way it throws you into a brutal post-apocalyptic scenario with almost no instruction. You're fragile. Bullets are scarce. And zombies will infinitely spawn until you complete the map's tough (and partially randomised) objectives, like switching on generators or finding the keycode that unlocks a door. *NMRIH*'s unforgiving approach to zombie co-op practically guarantees that a few of your teammates will need to die as you trudge from your spawn area to the end of the level. Your eight-person survivor group is twice the size of *Left 4 Dead*'s, and a given round typically sees your team whittled down as players inevitably get separated, surrounded and eaten.

Most of *NMRIH*'s zombies are of the slow, vintage variety. They're easy to evade, but much more durable in combat, so the danger arises from their numbers and players' modest agility. You can only sprint for a brief period of time, so wandering into a cluttered garage with a single exit, for example, is sometimes all it takes to doom you. A handful of speedier zombies jog after survivors (some of which – harrowingly – are children), but *NMRIH* otherwise lacks any undead with special abilities like leaping, acid-spitting or tongue-lassoing. This gives the game a more grounded feeling; the molasses-speed creep of the horde gives you room to react, but the absence of a revival mechanic and the relative weakness of weapons has a way of turning small mistakes into permanent death.

Also refreshing is *NMRIH*'s emphasis on immersion. Like *DayZ*, the volume of voice communication is based on distance, meaning a far-off teammate's cries for help may go completely unnoticed. The game also doesn't place any interface, crosshairs or HUD on the screen by default, and all of its maps are pocked with corners that are absolutely saturated with opaque, impermeable darkness. A small antidote to this is the flashlight. It mercifully doesn't require fresh batteries, but just as you'd

expect in real life, you can't hold it and swing a sledgehammer or operate an M16 simultaneously. This design makes the seemingly banal role of 'flashlight holder' a vital role for guiding teams through unlit corridors – being the guy responsible for shining the light on enemies while your teammates whack away with shovels or chainsaws is genuinely helpful.

The melee weapons themselves take a lot of finesse to operate. Most of them swing slowly (and with a wind-up animation much lengthier than *Left 4 Dead*'s), meaning they're nowhere near the weed whackers you wield in Valve's co-op zombie game. And despite their decomposing state, the undead are durable, taking multiple hits to bring down unless you skilfully connect with their skull. A typical hand-to-hand fight is a tense tango of bobbing and weaving, angling to position yourself to just the right distance where your axe or machete can clobber a zombie but



Though it resembles *Left 4 Dead*, what *No More Room in Hell* shares with *DayZ* and *The War Z* is that it often makes fleeing from and avoiding the undead preferable to fighting them.

THE FIVE MOST IMPORTANT ZOMBIE GAMES

Over three decades, these titles have shaped (or will shape) the zombie genre as we know it.



Zombie Zombie

1984 (on ZX Spectrum), Spaceman Ltd

One of the first games to feature zombies as its subject, *Zombie Zombie* had a very indirect way of dealing with the undead – you had to lure zombies up to tall buildings and then trick them into falling off to their doom. Coincidentally, it was one of the first games to use two-channel sound.



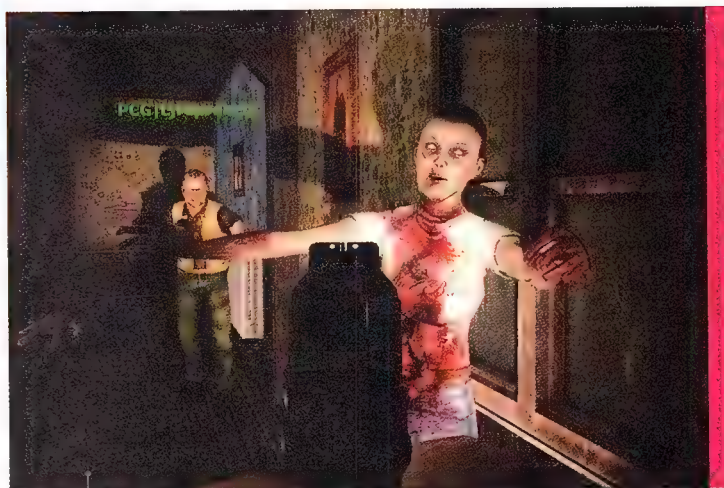
Resident Evil 4

2007 (on PC), Capcom

The *RE4* PC port was particularly bad, but the game still stands as the best 'actionisation' of the zombie genre. Japanese difficulty, boss design, and pacing tempered by Western playability and an over-the-shoulder camera spawned hordes of imitators. Weapon customisation lent meaningful progression to the dozens of brushes with undead creatures.



Zombies spawn endlessly in *No More Room in Hell*; this isn't a game that's afraid to overwhelm you with enemies. Some maps stack dozens of zombies directly outside the spawn room, only giving you a handful of bullets and melee weapons to deal with them.



"Behind you!" The snail-speed crawl of zombies in *NMRIH* makes room for communication and decision-making in a way that isn't present in most zombie-themed shooters.

the zombie can't hit you. This limited room for error makes individual zombie kills feel like a heroic effort.

Firearms are also handled with a modicum more realism than in *Left 4 Dead*. They're scarce, and pistols don't have infinite ammo – when you pick one up, it might have a meagre six or seven shots waiting for you in the magazine. Moreover, they're tough to aim – shots that look like a sure thing through ironsights won't always produce a kill. And like *DayZ*, most guns have a discrete ammunition type – you might find handgun ammo, but if it's .45 ACP and the only pistol you have is the 9mm Beretta M9, it's not going to help you.

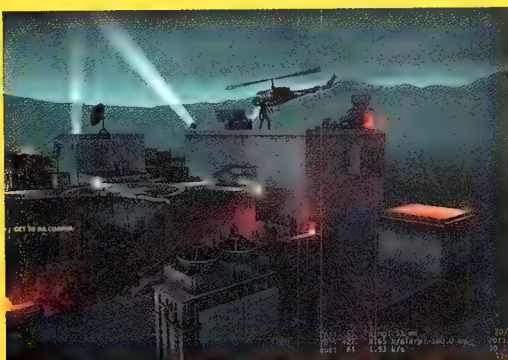
Appropriately enough, a lot of *NMRIH*'s scares arise from the lack of room in its levels. Structurally, they resemble *Left 4 Dead*'s meandering, point-to-point sprints, but aggressive collision detection between zombies and even other teammates means it only takes a few zombies to block a doorway.

Our favourite level is called Cabin and begins with a leap of faith. You spawn in a secure attic, and begin by combing dark corners for melee weapons, flashlights and whatever you can find. But to start the level, you have to drop straight through a hole in the ceiling – a one-way trip that usually makes the first survivor in instantly popular with zombies. Our tactic is to have this leading player lure zombies away from the entrance so the rest of the team can safely descend. The lead usually gets beat up in the process, but it's preferable to throwing everyone into a crowded, panicked melee.

A final twist on all this layered brutality is *NMRIH*'s infection mechanic. Zombies will occasionally grapple you, and if you or a teammate is unable

to shake them loose, you'll get bitten. You know what happens next – within minutes you'll drop dead and rise again as an AI-controlled zombie. It's surprising that the mod is the only zombie game we know of to model this classic horror trope.

The development team has slaved away on new features including National Guardsmen NPCs that will help or hinder you, additional game modes and playable characters, throwable weapons and a full dismemberment system. *NMRIH* is a stand-out take on zombie survival, and the scariest multiplayer game we've ever played. Unlike in *Left 4 Dead*, trying to kill every zombie you meet is the surest way to have your human card revoked. **BTTC**



Left 4 Dead

2008, Valve

The reigning champ in zombie co-op, *L4D*'s mildly forking level design and 'zombie director AI' combined to create movie-like campaigns that wickedly and dynamically threw threats at your survivor group as you progressed through each chapter. Another *L4D* innovation, asymmetrical multiplayer, has been copied in games such as *Dead Space 2*.



The Walking Dead

2012, Telltale Games

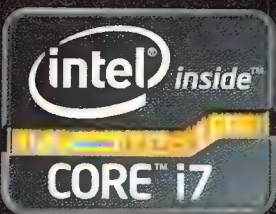
Telltale's adventure spin-off of the Robert Kirkman comic book series has taken a novel-like, 'Choose Your Own Apocalypse' approach to the genre. Though it's modest on interaction, choices you make – from who to rescue to which friend should get a candy bar – affect the content of future episodes. The five-episode series has already been renewed for a sequel.



Dead State

2013, DoubleBear Productions

Zombie shooters have been done to death; *Dead State* is a turn-based RPG due in December this year. Described as *Fallout*-meets-*The Walking Dead*, it's helmed by *Vampire: The Masquerade* writer/designer Brian Mitsoda. You play as the leader of a group of survivors holed up in a Texas elementary school. The game raised its funding goal with \$332,635 on Kickstarter in July.



Intel® Core™ i7 processor Extreme Edition

NRGTM

HARDCORE GAMING SYSTEMS

EXPLOSIVE GAMING
INDUSTRY LEADING COMPONENTS

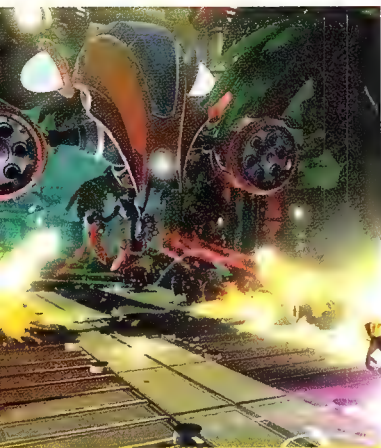
**EXTREME
OVERCLOCKING**

**CUSTOM
WATER COOLING**

NRGTM
Hardcore Gaming Systems

nrggaming.com.au

Intel, the Intel Logo, Intel Inside, Intel Core, and Core Inside are trademarks of Intel Corporation in the U.S. and/or other countries.



RATCHET & CLANK: QFORCE

Insomnia's 10th anniversary commemoration to you.

@ au.playstation.com/
ratchetqforce
\$ \$24

PS3

QForce, known as *Full Frontal Assault* in non-PAL countries, picks up where the PS2's *Ratchet & Clank 3* left off. Our intergalactic team was set up by Captain Qwark to impede Dr Nefarious's evil plans and now a bored Qwark is ecstatic to reinstate the *QForce* when a mysterious alien invasion ensues.

Players can choose to play as Qwark, satirical Ratchet or trusty sidekick Clank in this third-person platform adventure, which reverts back to old school *Ratchet & Clank* gameplay with a new tower defence element – set up your own network of defences, explore abundant alien landscapes, and don't let the enemy destroy your generators – thrown in for a little diversity.

Story mode, while visually appealing in a Pixar-esque way, is unfortunately a somewhat lacklustre affair. Multiplayer is where the real fun lies; in stages Recon, Squad and Assault, your aim is to collect more weapons than your opponents and build an impenetrable base while attacking your mates. For the \$24 price tag, it's easy enough to look past the short-lived single player experience.

GH

Call of Duty: Black Ops II

New, interesting mechanics and a threaded plot. Are you sure this is *CoD*?



PC

@ callofduty.com/blackops2

It's the ninth title in the franchise, so it's safe to assert that you know exactly what you're in for. There's the short, bewildering single player campaign revealing how the latest in a long string of – generally 'splosion-based – terror is thwarted. Then there's the meat-and-potatoes online multiplayer where most, if not all, of the player's time is spent. Meanwhile the player base (yes, me too) bemoans the lack of novelty, evolution and inspiration, yet still manages to accrue as much overall playtime as a full-time job. For the most part *BLOPSII* happily follows this trend. Until suddenly, it throws out a couple of new ideas and we (I) realise that the older stuff is a little better.

There are two connected stories in the campaign, which take place as a series of playable flashbacks at the end of the first Cold War in 1986 and in real-time during the next one, against China in 2025. Both regaling the rise and fall of the Nicaraguan narco-terrorist Raul Menendez brought down by father and son protagonists Alex and David Mason.

It's definitely one of the more memorable *CoD* plots, and even features multiple endings influenced by player choices, but getting to the good ending takes much more than activating stealth camo and headshotting with the new future-tech weapons. It means first getting through the new Strike Force missions, which are essentially Tower Defence/RTS-based, where players command squad UAVs,

\$ PC \$98, consoles \$108

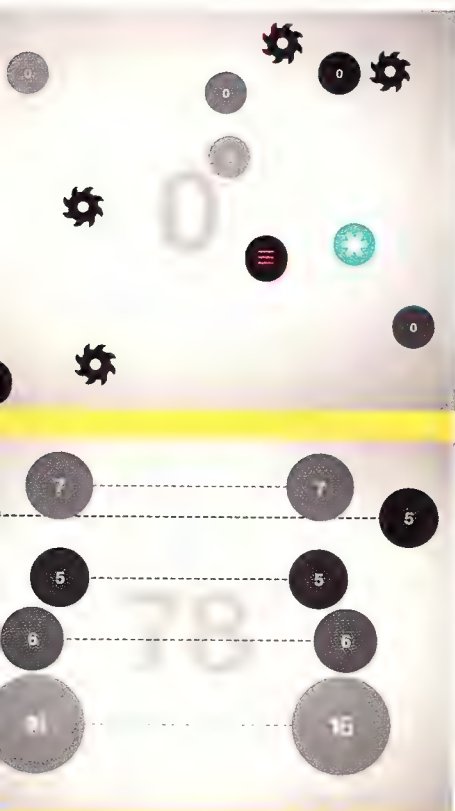
troops and robots against an AI enemy to fulfill objectives. It's not awful. In fact juggling priorities, issuing squad movements and allocating targets from above, then zooming in to control individual units directly in first-person is almost fun. It's just hamstrung by fundamentally poor AI. We actually found it easier, and more effective, to ignore the over-the-top management and simply stick to one unit while running around taking care of business ourselves. It's nice to get a sniff of shooter evolution, but not if it's partially broken.

On to the multiplayer. It's fast-paced twitch-shooting with a bucketload of single and team-based competitive game types for players to sink into while incrementally grinding out the drip-fed rewards. It's the *CoD* we know and love, but if by chance you've never played *CoD* multi before, *BLOPSII* is the best time to get started, thanks to the updated player loadout options. Previous iterations and perk/loadout limitations saw players shoehorned into almost boringly identical class moulds. Instead there are now 10 'points' for players to distribute as they see fit. So while one player might operate with both a kitted-out rifle as well as a pistol, another may ditch the pistol and instead spend that 'point' to add another attachment to the rifle. Or ditch weapons altogether and only run with a knife and additional perks. Fun.

Troy Coleman

- ✓ Core multiplayer changes make for a more diverse experience, RTS elements are interesting...
- ✗ ...only to be hamstrung by weak AI.

7
10



HUNDREDS

Frustrating and absolutely infuriating. Get it.

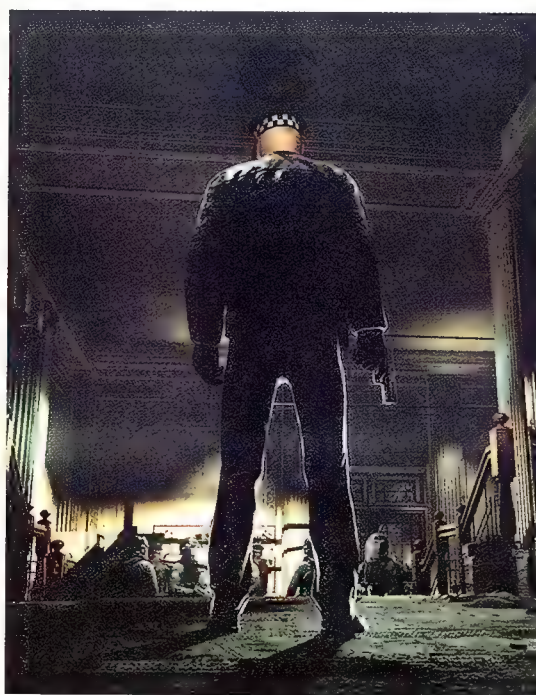
@ tinyurl.com/byyzehd
\$ \$5.49

IOS

If your idea of a good game is incessantly throwing yourself at the mercy of increasingly frustrating, seemingly improbable tasks until the urge to break something erupts, then do I have something for you! *Hundreds* asks nothing more of its victims than simply touching and holding one or more circles until a counter reaches 100.

Easy, right? Well yes, at first, until the difficulty ramps up and the circles start shifting and colliding or worse – are beset upon by progress-hindering spinning blades of death. While I can definitely recommend picking it up, *Hundreds* is a young person's game. It's taught me that even though I've been honing my touching stuff skills for (x) years now, the older I get, the worse I seem to become.

TC



Hitman: Absolution

An assassination game for the discerning stealth aficionado.

PC

@ hitman.com

\$ PC \$78, consoles \$88

Now up to its fifth release, *Hitman: Absolution* picks up the tale of the sexily bald and snappily dressed assassin Agent 47 where *Blood Money* left off.

After a contract on 47's ex-handler doesn't go as planned, he finds himself caring for a teenage girl, on the run from the Agency and framed for murder. Time to kill some people and figure this whole mess out.

Players are dropped into each level with little more than a garrote and a target(s) and the aim is to carry out the mission and slip away unseen. There are a handful of additional kill methods available, so getting the job done can be simple strangulation or a contrived combination of eavesdropping, distraction, poison, industrial accidents, explosion and disguises.

Unfortunately the 'unseen stealth killer' levels are interspersed with cover-to-cover, mini-map-watching evasion levels which work well enough to carry the story, but series purists will be disappointed with the incongruous feel. If that's you, then the fantastic user-generated Contracts system should satisfy: select a level, a target to assassinate and weapons, and then upload for others to enjoy. It's seamless fun but can also be a little frustrating at times.

Troy Coleman

- ✓ Diverse stealth assassinations, solid controls, contracts system is great.
- ✗ Evasion levels feel like content filler.

8
10



Pro Evolution Soccer 2013

Cristiano Ronaldo's on the cover. Again.

360

@ konami-pes2013.com/en

\$ \$88

I have to admit, I've always been a *FIFA* fan. So the question is: Has *PES 2013* managed to win me over? In a nutshell, not particularly. There are, however, some great new features to Konami's latest instalment, which doesn't hurt its chances.

FullControl gives the player *total* ball control in determining the height and power of each shot/pass. This is great for seasoned players who are familiar with the controls and crave more accountability, but if you're just starting out, it could be tough to tackle.

Dribbling is another obvious update from *PES 2012*, as player speeds feel substantially slower. I preferred dribbling faster, though some will like the slower, more realistic pace. To offset this, when defending, players can use the R2 and X buttons to slow down attacks.

PES scores for improvements in player recognition and ProActive AI. The most irritating thing in any game is when the AI completely suck, or move and respond in stupid ways, so *2013* has augmented the pace and steadiness of the AI for added realism.

It's solid, competitive and visually sharp, but even with the usual extras (such as Master League), it's not likely to draw any of the *FIFA* crowd. Myself included.

Goldie Hong

- ✓ Recognisable players, ProActive AI.
- ✗ Essentially *PES 2012* with a few tweaks.

7
10



ZombiU

Tense horror amid the tourist traps.

WII U

You wouldn't think that anything clever could be done with zombies any more. Equally, you wouldn't figure family-friendly Nintendo to house a hardcore horror game amongst its launch lineup for the Wii U.

Ubisoft's *ZombiU* is a tense survival horror zombie-fest set in a post-apocalyptic London. You wake up as a sole survivor – or so you think – and make your way through the shambles of London.

ZombiU's best conceit is the fact that you're underpowered and even a single zombie is a challenge; when you get swarmed – and you will – you're pretty much toast unless you're prepared.

Die, and another random 'last survivor' emerges from the same bunker to face your previous, now undead, player. If you're good enough you can recover the backpack with all your survival goodies from the previous life, and if you've got Miiverse friends, they may randomly pop up as zombies.

@ zombiu.ubi.com

\$ \$88

Still, this game gives you supplies begrudgingly, so every corner is potentially stacked with peril. It isn't always fair, as a single bite can take you down, and very rarely you'll find a Zombie spawned in a previously cleared locked down area. Mostly, you'll be too caught up in the ongoing narrative to care.

Zombi U makes a reasonable stab at including the Wii U's gamepad into play, using it as a combined map, scanner, flashlight and scope. Still, this isn't a zombie blasting game; it's very pure and exceptionally gripping survival horror – the kind of thing that you'd figure nobody made any more.

Alex Kidman

- ✓ Genuinely scary, good use of Wii U gamepad.
- ✗ Some unfair deaths.

9
10



LOTRO: RIDERS OF ROHAN

Ding!

@ rohan.lotro.com

\$ US\$49.99 via Steam

PC

If you've been on hiatus from fantastic F2P MMO *The Lord of the Rings Online*, its latest full expansion *Riders of Rohan* might be a good time to jump back in. On top of the usual array of upgrades that come with an MMO expansion: new deeds, quests, expanded crafting, loot, continued epic storyline and level cap increase from 75 to 85, the key new feature is mounted combat.

You may as well retire the nags you've been flogging to this point – you'll need a war steed to get around Rohan, which comes upgradable through the three distinct trait lines.

Each class has a unique mounted combat role and skills, but when compared to each other, it feels like some are more suited than others. My only disappointment is that my master of shadows Burglar can't stealth while on horseback.

TC



XGAMER

Buy ANY Windows 7 or 8 OS
with ANY Gaming System
and we will install it FREE!!

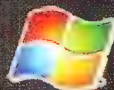
www.gamedude.com.au

P: (07) 3387 1500 F: (07) 3387 1599 E: sales@gamedude.com.au
3353 Pacific Highway, Springwood QLD 4127





Windows 8



Windows 7



CRAP MAP APP

If you were under any doubt as to the ongoing ramifications of Apple's so-called 'Mapgate' fiasco last year, here are a couple of statistics that help to illustrate the scale of iOS users' qualms over Apple's home-baked Maps effort. Within 48 hours of the new and improved Google Maps for iOS being launched in December (after Apple dumped the former Google app from iOS 6 and replaced it with its own error-laden program), the new Google Maps had been downloaded over 10 million times. Even more impressive, the release of the new Google app led to a staggering 29% increase in iOS 6 adoption, as stalwart iOS 5 holdouts refused to succumb to iOS 6 and the buggy maps they contained. It just goes to show that iOS users might be suckers for all things Apple, but they still know Google quality when they see it.



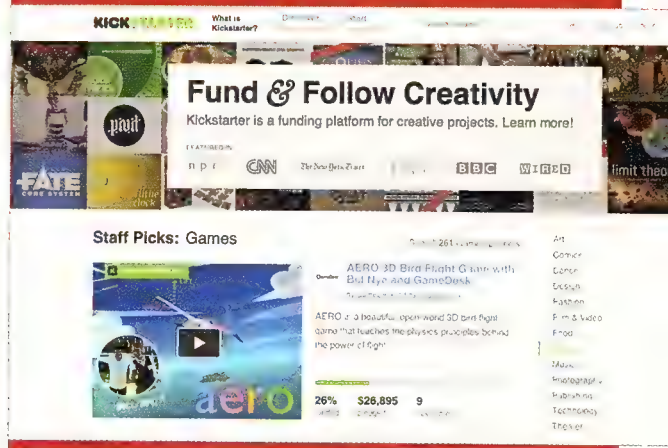
Pinterest

PINNING ARMAGEDDON

Maybe it's because 2012 was supposed to be the end of the world (per ancient and mysterious Mayan prophecies, very loosely depicted in the uproariously absurd blockbuster 2012), but there's an awful lot of doomsday-themed pinning taking place on Pinterest. As BuzzFeed discovered, you'll find tons of boards assembling various survival gear and whatnot for the imminent 'End of the World', 'Apocalypse' or 'Zombie Apocalypse' that is bearing down upon us. Who knew survivalists had such an eye for pictorial collage? **ATC**

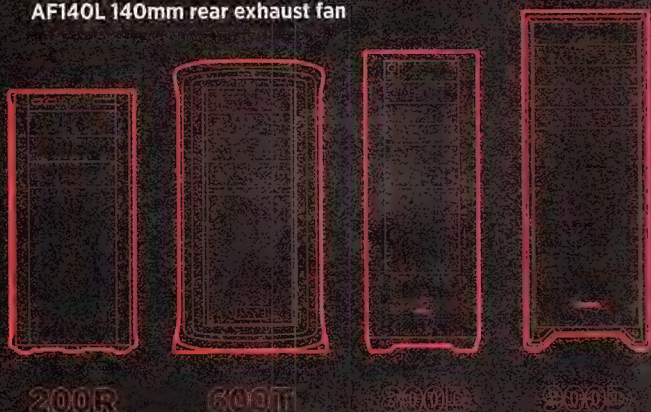
FAR FROM THE MADDING
CROWDFUND'S ORIGINAL
SHIPPING DATE

Crowdfunding might be all the rage right now – it certainly enables all sorts of hugely interesting and useful projects that might otherwise never see the light of day to see said light of day – but that's not to say it doesn't come with a few perils and pitfalls. Chief among these is the unfortunate lack of any solid guarantee that your cash investment will result in a tangible thing, should the project go belly up. And even if it does come through, there's still the likely prospect of delay. How likely? Well, a recent study by CNNMoney found that of the top 50 highest-funded projects on Kickstarter (the world's largest crowdfunding platform), a whopping 84% missed their original deadline. So the next time somebody hits you up to help fund their lifelong dream thing, try to bear in mind there's only a 16% chance they'll hit the target date. And proceed to extrapolate further doubts from there.



25.5" **SUPER TOWER**

- > Ten expansion slots
- > Five radiator mounting points
- > 15 total fan mount locations
- > Fits up to nine hard drives or SSDs
- > Room for dual power supplies
- > Includes three AF120L 120mm front intake fans and one AF140L 140mm rear exhaust fan



What will you do with all this room?

OBSIDIAN SERIES 900D is for serious builders with big projects.

Do you want to design your ultimate dream PC? Add state-of-the-art liquid cooling or air cooling? Build a quadruple GPU, dual CPU graphics powerhouse? Or, just create a monster file server?

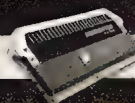
If these are the kind of questions you're asking yourself and you want it all in one, you need a 900D.

With an unprecedented combination of flexibility, volume, and builder-focused features, the 900D is ready for your next big project. The next question: when do you start?

Learn lots more at corsair.com/900D.



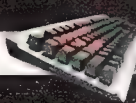
CHECK OUT THESE OTHER CORSAIR PRODUCTS DESIGNED TO MAKE YOUR PC THE BEST PC



MEMORY



COOLING



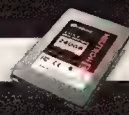
KEYBOARDS



MICE



HEADSETS



SOLID-STATE DRIVE

KGUARD[®] SECURITY

Protect Your Home or Business Today!

With support for 4, 8 or 16 cameras KGUARD lets you monitor & record your valuables from anywhere in the world. Dedicated Apps for all popular platforms give you peace of mind in the palm of your hand, anytime, anywhere.

- Powerful zoom + advanced recording capabilities provide increased security

- KGUARD's 'All-in-One' kits provide everything you need to get started right away

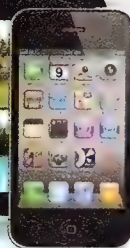
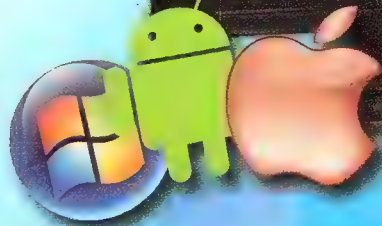
- Exclusive KView software completely developed in-house by KGUARD offers unmatched features and performance

- DIY setup and installation requires no professional assistance!



TRY
BEFORE
YOU BUY

Download the KView APP
to remotely monitor
a KGUARD camera
right now! →



Proudly Distributed by

Anyware[®]

The Home of Computer Accessories

www.anyware.com.au

Exclusive Distributor for Australia

PH: 1300 269 927 or visit www.anyware.com.au/KGUARD

Anyware is a wholesaler and does not sell direct to public.
The above products can be purchased from most independent computer dealers
throughout Australia. Call the number above for your nearest reseller.



Don't cook your Notebook
this summer...



Deepcool's range of Notebook
Coolers improve Notebook
performance by efficiently and
safely dissipating heat.



M3

- 140mm fan
- Brushed aluminium
- Built-in 2.1 multimedia sound system
- 5 colour choices



MULTI CORE X4

- 4 x 100mm fans
- Multi-core Control Technology (M.C.C.T.)
- 4 status controls
- Original butterfly design
- Anti-slip base



MULTI CORE X6

- Dual 140mm fans + Dual 100mm fans
- Multi-core Control Technology (M.C.C.T.)
- Double angle adjustments ensure comfort
- 2 x built-in USB 2.0 ports



DISTRIBUTOR

Anyware®
The Home of Computer Accessories

PHONE

1300 269 927

WEBSITE

www.anyware.com.au

Save up to 95% on printing costs



Free delivery!

- On orders over \$95
- Next day delivery
- Easy to install
- Support all major printers

SAVE



THE ULTIMATE
CHOICE FOR
**YOUR
DREAMING
COLOUR**

WHITE INK FOR
T-SHIRTS/SOLVENT UV LED ECO-WATER

Don't printing on white fabric and 1 dots.
Dyeing the fabric with heat presser at 140-150°C for 1-2 minutes.
The colorful image is available on dark background by using white ink.

Great deals at **ridiculous** prices!

\$ 149⁹⁹

CISS compatible with Epson printers**

Artisan 730, 835, 837, 635, 1430
Expression XP-100, XP-200, XP-300, XP-400
WorkForce WF-2520, WF-2530
TX800FW, TX810FW, TX700W, TX725W, 1410, T50
Supported: 81N/82N (more items are available online)



**SUPPORT NEW
EPSON PRINTERS**



\$ 149⁹⁹

CISS compatible with Canon printers**

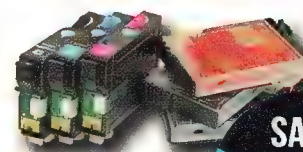
IP4850, IP4950, MX885, 895, 715, IX-6550
MG5150, 5250, 5350, 6150, 6250, 8150, 8250
Supported: CLI-526, PGI-525BK
CLI-521, PGI-520BK/CLI-8, PGI-5BK, ...



\$ 10⁰⁰

Refill ink (100ml)

\$10.00 for each colour
Available for all major printers



\$ 96⁰⁰

**Refillable ink cartridges
(inc. 100ml ink for each colour)**

Available for all new Epson** printers
Supported: 200xl, 138, 133, 73N, 81N, 82N, ...



MIR-AUS®

More products are available on: mir-aus.com.au

Address: Unit 5/36 O'Riordan St, Alexandria NSW 2015
Phone: 1300 213 589 or (02) 80655614, Email: info@mir-aus.com.au

Follow us: mir-aus

*Price comparisons are based on the equivalent amount of ink and usage of genuine cartridges.

**All brand names, photos and trademarks are the property of their respective holders and are used for reference only.

ROBUST™ CISS

140ml Ink for each colour

100ml Extra bottle of ink for each colour





Natcomm
AUSTRALIAN INNOVATION



Ph (07) 5596 5128

Telecommunications Solutions

SAVE MONEY • IMPROVE EFFICIENCY • ADD A PROFESSIONAL TOUCH

FAXSTREAM DUET AND FAX SWITCHES

Duet Switches for Home or Business

Fax Switches for Home or Business

Save rental costs for a separate fax line

Easy user installation



DOOR PHONE INTERCOM FOR HOME TELEPHONES

Will ring all Telephones, just answer to talk

Works with Cordless Phones

Can open Doors or Gates

Can dial out to Cell Phone

Home Automation Integration



DOOR PHONE INTERCOM FOR ANY PABX

Extension Connect

Trunk Connect

Can open Doors or Gates

Video and Keypad options

Touch tone dialing



CHOICE OF MULTIPLE INTERCOMS

Marine Grade Stainless Steel

Touch Switch Activation

Flush and Surface Mount

Video Camera options

Keypad Entry options



MESSAGE ON HOLD FOR ANY PABX

Digital Message On Hold

MP3 files stored on Flash Card or in memory

Automatic Message Updates or Timed changes

Optional After Hours Announcement



MESSAGE ON HOLD FOR SINGLE LINES

Operates with standard phones

Operates with cordless phones

Optional Call Attendant facility

Optional After Hours Announcement



BACKGROUND MUSIC AND MESSAGING

Up to 4000 songs on SD Flash Card

Intelligent Messaging or Music only

Integrated Amplifier

Instant Message on Demand



DIGITAL AUDIO FOR MESSAGING or PROMOTION

Up to 250 messages on SD Flash Card

Switch or PIR activation

Timed Activation

1-12 separate inputs

1-12 separate outputs

Powerful 8W amplifier



MODEM SWITCHES EFT-POS SWITCHES

For Dial Out Modems

For Dial In Modems

Multiple Modem Switch

Eftpos Switch

Two Line Eftpos Switch



TELEPHONE LINE SWITCHES

Privacy Switch

Barge In Switch

Multiple Number Switch

Ring Delay Switch

Two Line Switch

Custom Solutions



CONTROL EQUIPMENT BY TELEPHONE LINE

Switch Power ON or OFF Reset Power

Touch Tone Controlled Relays

PIN Security option

Share your line with FaxStream Duet or Multiple Number services



CONTROL ACCESSORIES

240V Power Switches

Normally ON or Normally OFF operation

PC Reset unit

Easy User Installation



CALL RECORDING FOR PABX OR SINGLE LINES

Single Line Model

PABX Handset Models

PC based software

Record and Playback

Easy User Installation



PABX ACCESSORIES

Paging Switches

Automatic Call Attendant / Automatic Announcement Device

Door Stations

Message On Hold

PABX Fax Switch



TELEPHONE LINE ACCESSORIES

Ring Indicator

Line In Use Indicator

Ring Booster

Telephone Call Transfer

Telephone Line Monitor

Telephone Auto Dialler



TELEPHONE LINE SIMULATORS

Ideal for Test and Demo

Australian Dial Tone and Ring

CallerID output option

International Models for 22 separate countries



30 day money back guarantee • designed and manufactured in australia • two year factory warranty

For a complete description of your solution, please call :

**AUSTRALIA
NEW ZEALAND**

**Phone (07) 5596 5128
Phone (0800) NATCOMM**

**Fax (07) 5596 5121
or (0800) 628 2666**

**Email info@natcomm.com.au
Email nz@natcomm.com.au**

**Web www.natcomm.com.au
Web www.natcomm.co.nz**



Visit our comprehensive Web Site for information, brochures, prices, installation diagrams or to place an order.

ultra station

Turn Any Laptop into a Powerhouse!

j5create®



Windows 8 Compatible

Model : JUD500

- USB 3.0 Fully Functional Laptop Docking Station
- Elegant Design, Superior Functionality
- Transform your Mac & PC into a full-size powerhouse workstation
- Add an extra HD display via HDMI or VGA
- Contains Wormhole Switch Technology!
- A simple USB connection to any other
- Windows or Mac computer that allows you to drag and drop or copy & paste files quickly and easily !



j5create® sales@j5create.com
www.j5create.com

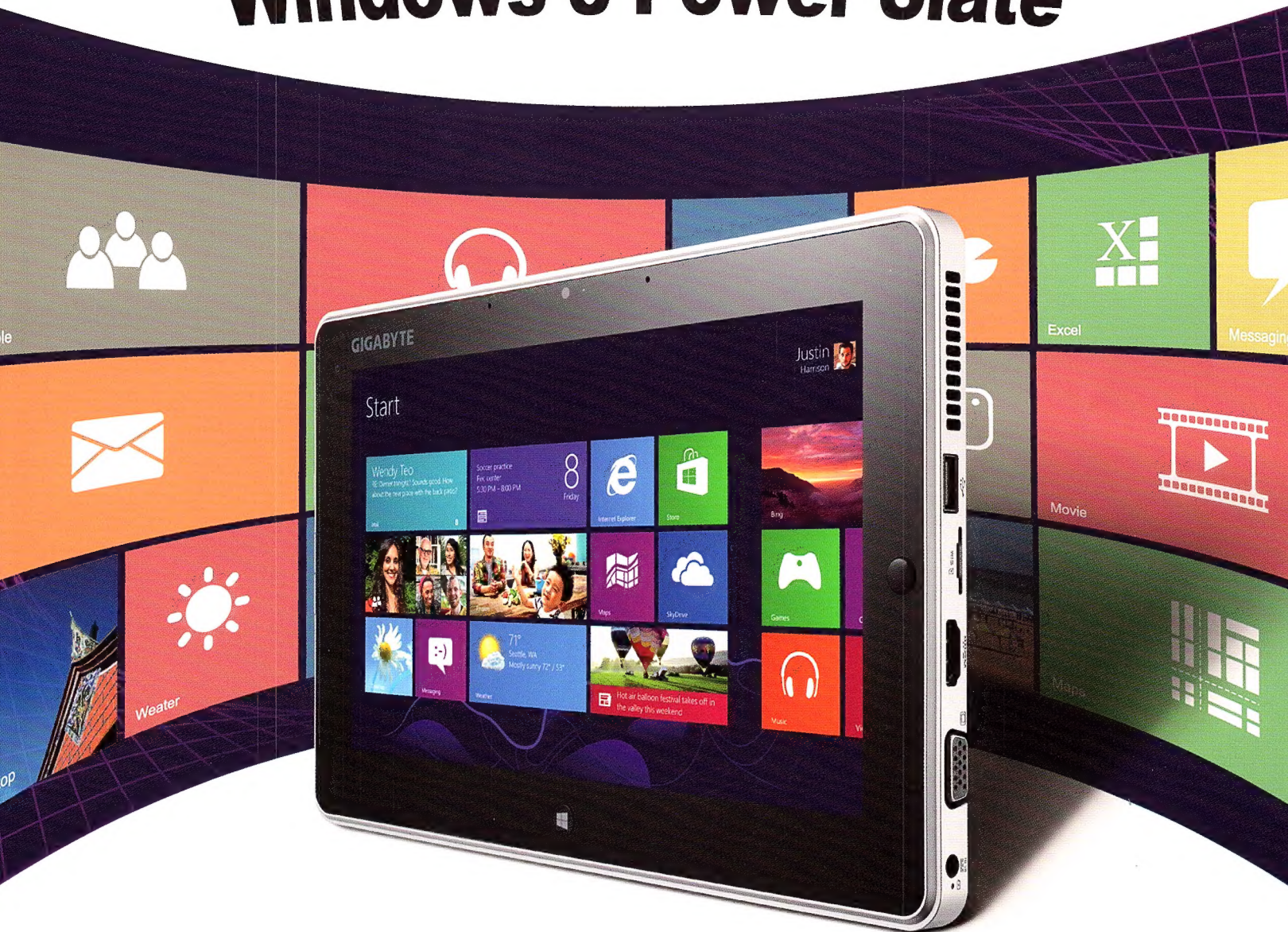
KaiJet Technology International Ltd.



1300 131 660
altech.com.au

Exclusive Distributor for Australia

Power in Your Hands – 500GB! Windows 8 Power Slate



10.1" Slate PC S1082

• Windows 8 • Dual-core Processor • 500GB Huge Storage • Full I/O Ports

ALTECH
COMPUTERS

NSW

ARC Computers
Capitol Computers
J&W Computers
Octagon International
Online Centre
Cyber Planet

arc.com.au
capitolcomputer.com.au
jw.com.au
octagoninternational.com
onlinecomputer.com.au
cyberplanet.com.au

TAS

JTC Tasmania

jtc Tasmania.com.au

WA

Austin Computers
Enable Technology

austin.net.au
enabletech.com.au

VIC

Centre Com Sunshine
Computers & Parts Land
PC Case Gear
Scorpion Technology

centrecom.com.au
cpl.net.au
pccasegear.com
scorpiotac.com.au

QLD

Computer Alliance Pty Ltd
Computer Function Pty Ltd
Game Dude
ITS Direct

computeralliance.com.au
computerfunction.com.au
gamedude.com.au
itsdirect.com.au

ACT

Principal Computers

principalcomputers.com.au

SA

Computer Station
Getright Computers
PC Plus
Majcom Technology

computerstation.com.au
getright.com.au
pcplus.com.au
majcom.com.au

Beautiful, fast, fluid  Windows 8

EPSON
EXCEED YOUR VISION



STOP

www.epson.com.au
www.epson.co.nz